

# DADE BEHRING

## Service Manual

### **autoSCAN<sup>®</sup>-4**

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Automated  
Microbiological  
Panel Reader

## Volume 1

For Internal Use Only

9020-6468, Rev. A

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**Dade Behring Inc.**

Dade MicroScan Inc.  
1584 Enterprise Blvd.  
West Sacramento, CA 95691 USA  
(916) 372-1900  
(800) 677-7226

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## Revision Record

<b>Rev.</b>	<b>Date</b>	<b>Affected Pages</b>
A	June 1999	Initial Printing.

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# **autoSCAN<sup>®</sup>-4 System Overview**

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## **1.1 Introduction**

### **1.1.1 What is Covered**

This manual contains pertinent information required to test, adjust and service the autoSCAN<sup>®</sup>-4 Microbiological Panel Reader. This section covers instrument description and cautions.

### **1.1.2 Description of the Sections**

The various sections in this manual provide information as follows:

Section 2.0: General Description, provides information relative to each major subassembly within the autoSCAN<sup>®</sup>-4.

Section 3.0: Assembly Descriptions, provides information relative to subassembly testing, adjustment and replacement.

Section 4.0: System Diagnostic Tests, provides information relative to diagnostic testing.

Section 5.0: Alignment and Test Procedures, provides procedures for aligning, calibrating and testing the autoSCAN<sup>®</sup>-4.

Section 6.0: Preventative Maintenance, provides a complete preventative maintenance procedure for the autoSCAN<sup>®</sup>-4.

Section 7.0: Troubleshooting, provides troubleshooting guidelines for the autoSCAN<sup>®</sup>-4.

Section 8.0: Provides a complete listing of replacement parts available for the autoSCAN<sup>®</sup>-4.

## **1.2 Instrument Description**

### **1.2.1 Intended Use**

The autoSCAN<sup>®</sup>-4 Microbiological Panel Reader is intended to be used as a diagnostic tool for determining the identification and *in vitro* antimicrobial susceptibility patterns of microorganisms isolated from human clinical specimens. It is used in conjunction with MicroScan<sup>®</sup> microdilution panels which contain antimicrobics in serial dilutions, and selected biochemicals (see Figure 1-1).

### **1.2.2 Explanation of Instrument Operation**

MicroScan® panels are inoculated with microorganisms isolated from clinical specimens and incubated for the amount of time stated in the appropriate panel procedural manual. Following incubation, the panels are inserted into the drawer of the autoSCAN®-4 and are scanned by the reader.

The instrument incorporates an array of light sensitive photodiodes that detect the amount of light passing through each well of the test panel. Each photodiode generates an electronic signal that corresponds to the amount of light it detects.

The electronic signals are then processed by the onboard computer and sent to the Data Management System (DMS) computer which compares them to stored control values and calculates the organism identification and/or antimicrobial susceptibility patterns as described in the following paragraphs.

Antimicrobics are present in varying concentrations in the wells of each MicroScan® panel. The turbidity will be less in those wells in which growth has been inhibited by the antimicrobial. The autoSCAN®-4 compares each test well reading with a threshold value that is derived from the turbidity readings of the control well in that panel, and determines if there is growth in each well. In this way, the Minimum Inhibitory Concentration (MIC) of each antimicrobial is determined by the instrument.

The identification of microorganisms is accomplished by measuring a series of biochemicals contained in panels designed for the specification of Gram-negative and Gram-positive bacteria. The panels contain biochemicals that undergo reactions with the microorganisms that may be seen by a color change due to a shift in pH, the addition of reagents, or by the presence or absence of growth in some wells.

The autoSCAN®-4 and DMS provide easy, efficient collection, storage, editing and retrieval of patients specimen results. In addition, multiple reports are collated and generated at the operator's discretion.

### **1.2.3 Principles of Test Procedure**

Determination of MIC's and bacterial identification are based on measurement of the turbidity or color changes in the wells of the MicroScan® panel. Both the MIC and identification are automated methods directly parallel to standard manual methods. However, the automated system offers the advantages of reproducibility, speed of testing, avoidance of transcriptional errors and standardization for all tests run in a single laboratory. Because the methods parallel conventional manual techniques, equivocal results or uncommon organisms may be evaluated by a technologist using the same panel that was used in the automated reader. The automated reader is also capable, by virtue of the DMS software, of providing an adult treatment guide for physician use.



Figure 1-1, autoSCAN®-4 Microbiological Panel Reader

### **1.3 Safe Handling Practices**

THE INSTRUMENT EMPLOYS SOPHISTICATED OPTICS ASSEMBLIES AND SENSITIVE ELECTRONIC CIRCUITRY. Care has been taken to design and manufacture this instrument for the environment in which it is to be used. When handling the instrument or subassemblies of the instrument, keep in mind that proper handling will avoid system damage or adjustment. Read the entire manual before attempting calibration or repairs.

POWER AND VOLTAGE REQUIREMENTS for the autoSCAN®-4 are noted in the end of this section. Power line characteristics should conform to the National Committee for Clinical Laboratory standards specifications PSI-5, "Power Requirements for Clinical Laboratory Instruments and Laboratory Power Lines."



**NOTE:**

**ALWAYS CONNECT THE READER AND ITS ASSOCIATED EQUIPMENT TO A 3-WIRE GROUNDED RECEPTACLE OF THE SAME VOLTAGE AND CURRENT RATING SPECIFIED ON THE DATA PLATE ON THE BACK OF THE INSTRUMENT.**

MAKE CERTAIN THE INSTRUMENT IS OFF before connecting or disconnecting the main power cord.

WHEN REMOVING OR INSTALLING ANY OF THE SUBASSEMBLY components in the autoSCAN®-4, the instrument must be off and the power cord disconnected from the wall. This will not only eliminate a severe shock hazard to yourself, but will also help to protect the system electronics.

WHEN TROUBLESHOOTING defective subassemblies, care should be taken when probing the designated testpoints inside the instrument and that exposed electronics are not shorted by dangling wires or probes. If troubleshooting is being performed on a circuit board, assure that only one trace per probe is addressed. If the probe touches two or more lines at once, permanent damage may be caused to the circuit board or other subassemblies associated with that board.

FUSE REPLACEMENT should only be performed when the instrument is off, and unplugged from the wall.

THE TUNGSTEN HALOGEN LAMP is a high energy device. When the lamp is operating, temperatures at the lamp reflector approach 250°F. Caution should be taken when handling the lamp to avoid burns.

When replacing a burned out lamp, leave the instrument on for ten minutes so the fan will cool the bulb.

When installing a new lamp do not touch the bulb. Fingerprints or any foreign substance on the lamp surface will cause a hot spot to develop at that location, resulting in premature aging and failure of the lamp.

THE FIBER OPTIC ASSEMBLY is a fairly rugged part, but certain precautions should be taken when handling this part. The glass surfaces of the fiber optics are finely polished and should not come into contact with abrasive surfaces. Any foreign substance on the ends of the fiber optics will cause a loss in light transmission. If the ends need to be cleaned, this should be done with lens paper. Avoid using any glass cleaners as these will leave a film on the fiber ends.

Any of the individual fiber optic channels should not be flexed any greater than ten times their outer diameter. This is approximately one inch. It must be remembered that one fiber optic channel is made of over a half-million individual glass fibers, and each time a fiber optic channel is handled a few of those fibers break. Therefore, handle the fiber optics with care and you should not have problems with it.

THE GLASS INTERFERENCE FILTERS are very precise optical devices. Avoid touching the surfaces of the filters. Fingerprints or any foreign substance on the glass will cause a loss in light transmission and could possibly damage the filter.

The filters should not only be handled by the edges. If the filter plate is taken out of the color wheel housing, set it down on lens paper only. Lens paper is the only substance that should come into contact with the filters.

#### autoSCAN®-4 SPECIFICATIONS

##### Power:

Line voltage: 105/115/230 VAC +/- 10%  
Line frequency: 60/50 Hz +/- 10%  
Line current: 2.00A MAX. (115 V), 1.25A MAX. (230 V)  
Leakage current: Less than 500 uA

##### Optical System:

Light source: Tungsten halogen lamp 3500 hrs. life  
Abridged filter photometer with six interference/filters  
(wavelengths/ in nanometers (nm)): 440, 470, 505, 560, 590, 620  
Spectral Bandwidth: 10nm  
96 channel fiber optics harness

##### Analyzer:

System panel capacity: 1 panel/reading  
Automatic panel loading  
Read time: less than 5 sec.  
System digital resolution: .1% of reading  
Transmittance range: 100/1  
Computer interface: RS-232

##### Environmental Conditions:

Temperature:  
operating: 16°C to 32°C  
storage: -30°C to 40°C  
Humidity: 0 to 95 % (no condensation)

##### Safety Requirements:

Ground impedance @ 60Hz: 0.1 ohms  
Dielectric withstanding voltage @ 1000 VAC  
60 Hz for 1 min.: No dielectric breakdown  
Power cord three conductor #16 AWG industrial grade SJT  
Overcurrent interrupter 1.60 A (115 V), .80A (220 V)

##### Dimensions and Weight:

Dimension: Width 19 inches, Height 10 inches, Depth 23 inches  
Weight: 40 lb.





## ***Section 2*** ***General Description***

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A BRIEF DESCRIPTION of the main subassemblies in the autoSCAN®-4 reader are listed below. For a more detailed description of each subassembly regarding required functional performance, see Section 3.

### ***2.1 The System Power Supply***

The System Power Supply develops +12.3 VDC for the power board. The power used in this system is developed by a switching power supply rated at 150 watts. The supply provides over-voltage protection circuitry to protect the system circuit boards if a power surge of sufficient magnitude occurs.

### ***2.2 The Power Board***

The Power Board contains electronic circuitry required to develop the proper voltage and current levels for all the electrical assemblies in the autoSCAN®-4.

### ***2.3 The Photo Board***

The Photo Board contains ninety-six (96) photodiodes arranged in a specific array, two reference diodes and the required multiplexing circuitry to electronically process signals from the photodiodes.

### ***2.4 The Control Board***

The Control Board which is a part of the power board assembly contains all the electronic circuitry for correct timing sequences required in the system.

### ***2.5 The Analog to Digital (A/D) Converter PCB***

The Analog to Digital (A/D) Converter PCB contains a twelve-bit A/D converter, electronic filters, eight-bit DAC and self-diagnostics circuitry. The DAC (digital to analog converter) is a feedback device to control the gain of each photodiode location. The A/D converter transforms the real world signal (analog) from the photodiodes to a digital signal (digital) for the computer to process.

## **2.6 The Central Processing Unit (CPU)**

The Central Processing Unit (CPU) contains a Z80 eight-bit microprocessor chip, read/write random access memory (RAM) and the necessary electronics required to accept and transfer electronic signals to and from the IBM computer and to and from the internal system electronics.

## **2.7 The Drawer Assembly**

The Drawer Assembly provides the electrical and mechanical components necessary for automatic panel loading and reading. Optical assemblies such as fiber optics channels and the photo board are housed in this assembly.

## **2.8 The Color Wheel Assembly**

The Color Wheel Assembly contains all the optical components necessary to produce visible wavelengths of light for the analysis of MicroScan® panels. A tungsten halogen white light source is used in conjunction with narrow bandwidth interference filters to produce these wavelengths.

## **Section 3**

# **Assembly Descriptions**

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### **3.1 Power Supply Subassembly**

#### **3.1.1 Main Power Supply**

The main power supply provides 12.3 volts DC to the lamp and to the system electronic circuits.

If 220 volts is to be utilized, insert a fuse of proper type and rating.

**NOTE:**

***The autoSCAN®-4 is not line frequency dependent. The reader will operate properly at either 50Hz or 60Hz.***

To test the DC voltage from the power supply, connect a multimeter between TP1 and TP4 on the power board. If the voltage is not 12.3 V +/- 50 mV, adjust the trimmer potentiometer (R25).

#### **3.1.2 Power Supply Removal**

Turn off the instrument and unplug the power cord.

Open the instrument.

Remove the stainless steel splash guard and enclosure bottom cross brace.

Remove the two retaining clips which hold the power supply cooling shroud to the enclosure. Remove the cooling shroud.

The power supply is then simply lifted out of the enclosure.

### **3.2 Power/Control Board Subassembly**

#### **3.2.1 Power and Control Circuit Boards**

This subassembly provides the voltages to operate the circuit boards and the drive currents to control two stepper motors. The Power/Control Board Subassembly is located at the left in the rear of the instrument.

POWER CIRCUITS provide +5 V, -15 V and +15 V to the electronic circuits.

To display these voltages, use the Field Service Diagnostic Test for the Power Control Assembly and select the DC Voltage Test. Voltages may also be measured directly on the Power Board with a multimeter. Connect the multimeter to TP5 for +5 volts, to TP3 for -15 V and to TP2 for +15 V. The acceptable range

for the +5 V supply is 4.75 V to 5.25 V; for the -15 V supply, -14.25 V to -16 V; and for the +15 V supply, 14.25 to 16 V. If a voltage is out of range, adjust R22 for the +5 V supply, R21 for the -15 V supply or R20 for the +15 V supply. To check regulator outputs for each supply, connect an oscilloscope or multimeter to the connector side of R19, R18, or R17. The average voltage should be less than 3 V for R18 and R19 and greater than 9 V for R17.

CURRENT LIMIT potentiometers R43, R44, and R45 are preset at the factory and should not be adjusted.

### **3.2.2 Opto-Interrupter Circuits**

The opto-interrupters used in the autoSCAN®-4 provide feedback to the CPU board to help control the movements of the two stepper motors.

THE COLOR WHEEL OPTO-INTERRUPTER is a dual beam device which senses when each filter location is in the correct optical path and when the home or neutral position has been reached.

Pins 14, 11 and 13 develop the signal for the opto's two LEDs. Pins 13, 2, 7 and 10 receive the detected signal from the LED.

To check the color wheel opto-interrupter circuits, a logic probe will be required.

**NOTE:**

***The logic probe should be compatible with CMOS. Damage to components on the control board could result if an improper probe is used.***

Access the diagnostics mode of the autoSCAN®-4.

Attach the logic probe to the connector side of R29 then R30 to verify that the +2 volts is present for the LEDs.

THE ON COLOR COMMAND is checked by attaching the logic probe to pin 15 of U12 on the control board.

While selecting option 3 of the color wheel diagnostics, the logic probe should indicate a logic level transition.

THE HOME COMMAND is checked by attaching the logic probe to pin 11 of U12 on the control board.

While selecting option 3 of the color wheel diagnostics, the logic probe should indicate logic level transitions.

THE DRAWER OPTO-INTERRUPTERS consist of the devices which determine when the drawer has traveled its maximum distance in either direction.

Pins 1, 5, 7 and 10 develop the signal for the opto's LEDs.

Pins 14, 13 and 11 receive the detected signal from the LEDs.

To check the drawer opto-interrupter circuits, a logic probe and multimeter will be required.



Access the diagnostic mode of the autoSCAN®-4.

Attach the multimeter probe to the connector side of R27, then R28 of the power board to verify that the +2 volts is present for the LEDs.

THE DRAWER OPEN COMMAND is checked by attaching the multimeter to pin 8 of U5.

While selecting option 3 of the drawer diagnostics, the logic probe should indicate a logic level transition when an opaque object is inserted in the opto beam path.

THE DRAWER CLOSED COMMAND is checked by attaching the logic probe to pin 5 of U5.

While selecting option 3 of the drawer diagnostics, the logic probe should indicate a logic level transition when an opaque object is inserted in the opto beam path.

### **3.2.3 Control Board Removal**

Turn the instrument off and unplug the power cord. Open the instrument.

By first depressing the retaining clip on the side of the plastic support standoffs, lift the front of the control board off of the standoffs.

**NOTE:**

***Do not lift the control board too high while it is still in the edge connector.***

Slide the control board from the edge connector mounted on the power board.

Replace the control board in reverse order as listed above.

### **3.2.4 Power Board Removal**

Turn the instrument off and unplug the power cord. Open the instrument.

Remove the support standoff from between the drawer mechanism and the power board.

Disconnect all three interconnect cables from the power board.

Remove the RS-232 cable from the back of the instrument.

Remove the two screws holding the base of the power board chassis to the Drawer Assembly.

Lift the power board out of the enclosure.

### 3.3 Photo Board Subassembly

#### 3.3.1 Photo Board Function and Tests

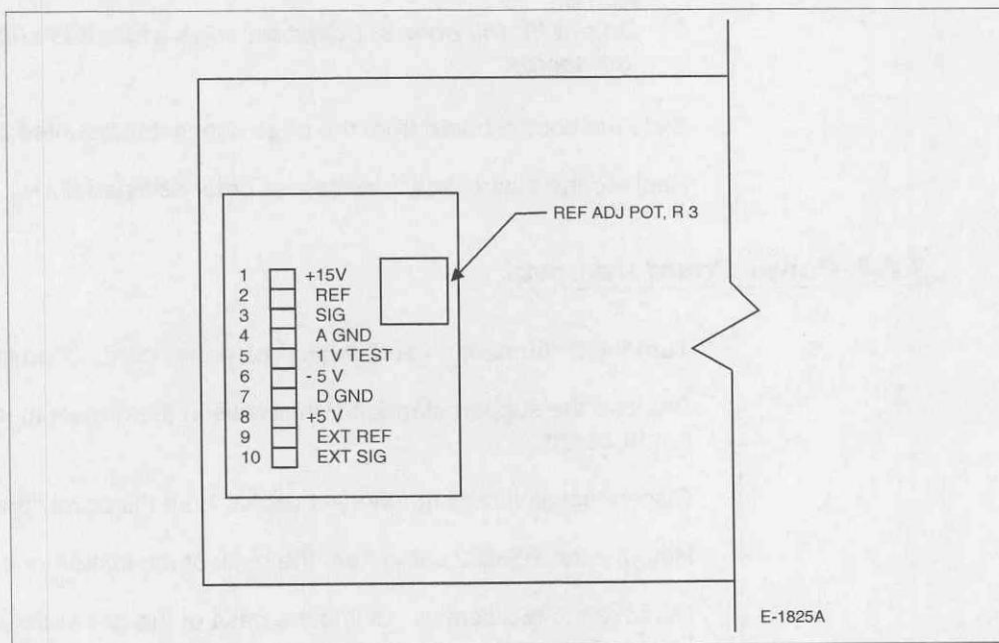
This subassembly is responsible for converting the light energy emitted from each well of the panel under test, to a usable electrical signal. This task is accomplished by utilizing ninety-six photodiodes (transducers). There is one photodiode associated with each of the 96 well locations of the MicroScan® panels. When a panel is being read, each photodiode is directly above its associated well location. Each well of the panel is in turn directly above a fiber optics channel. In this manner, each photodiode transfers electrical signals (associated with the particular well) dependent upon the amount of light passed through that well.

The electrical signals passing from the photo board do so in a serial fashion. Each photodiode is selected individually with high speed multiplexing circuitry.

Two reference photodiodes are also located on this board. These devices serve the purpose of converting all the transferred electrical signals to ratios. This method eliminates unwanted detected signal transients of fluctuations.

A test connector (J11) has been included on each of these boards for convenient connection to circuit test points. Pin connections are listed in Figure 3-1.

Figure 3-1, Photo Board Test Points



#### 3.3.2 To Test the Photo Boards

To test the photo boards, a multimeter is required.

Each of the ten test points on the photo board will be discussed individually in this section. Refer to Figure 3-1 as required.



1. +15 VDC verifies that this supply voltage is present on the photo board. The acceptable limits for this voltage are from +14 VDC to +16 VDC. Monitor test point 1.

2. REFERENCE VOLTAGE identifies that the reference signal is being transferred to the A/D board.

Access the diagnostics mode of the autoSCAN®-4.

Attach the multimeter to test point #2, with the ground clip connected to test point #4.

By depressing the reference test key, 110 mV +/- 10 mV should be observed. R3 adjusts the 110 mV level.

3. SIGNAL VOLTAGE identifies that the signals from the ninety-six photodiodes are being transferred to the A/D board.
4. ANALOG GROUND is the required reference point for testing and operation dealing with test points 1, 2, 3, 5, 6, 9 and 10.

Continuity may be checked between test point #4 and test point #2 of the A/D board.

5. IV STANDARD FROM THE A/D verifies that this voltage is present on the photo board. The acceptable limits for this voltage are from .90 V to 1.10 V. Monitor test point #5.
6. -15 VDC verifies that this supply voltage is present on the photo board. The acceptable limits for this voltage are from -14 VDC to -16 VDC. Monitor test point #6.
7. DIGITAL GROUND is the required reference point for testing and operations dealing with digital signals. Continuity may be checked between test point #7 and test point #4 on the A/D board.
8. +5 VDC verifies that this supply voltage is present on the photo board. The acceptable limits for this voltage are from 4.70 V to 5.30 V. Monitor test point #8.

**NOTE:**

***The ground lead of the multimeter should be connected to test point #7.***

9. THE EXTERNAL REFERENCE AND SIGNAL INPUT provides points to apply any external signal between the limits of -14 VDC to +14 VDC. Access test point #9.

### **3.3.3 Removing the Photo Board**

With the instrument turned off and unplugged, remove the four screws holding the photodiode cover to the drawer assembly.

Lift the photodiode cover from the drawer mechanism.

Disconnect the photo board to A/D board cable,

**NOTE:**

***The orientation of the cable to the photo board is critical and when reinstalled must be attached in the same fashion.***

Remove the four hex spacers holding the photo board to the drawer assembly.

Gently rock the photo board as you lift it off the collimation block.

Reinstall photo board in reverse order as listed above.

**NOTE:**

***Do not apply a great deal of force in tightening the hex spacers. Damage to the photo board or photodiodes themselves could occur. Be careful not to put fingerprints on the photo board.***

## **3.4 The A/D Board Subassembly**

### **3.4.1 A/D Board Function and Test**

This subassembly's primary function is to convert the analog electrical signals generated by the photo board into digital electrical signals. This digital information is then passed to the CPU board for processing and storage. The signal and reference voltages are amplified in the A/D board. Since there are different current levels for the individual photodiodes, a DAC (Digital to Analog Converter) is included in the signal line for automatic gain control. The log amplifier computes the logarithm of the ratio of the signal voltage to the reference voltage. A multiplex circuit is included to select either the output of the log amplifier or any one of a number of diagnostic test points for measurement. The output signal from the multiplex circuit is passed through a low pass filter to the A/D chip for conversion to binary code. Latches are employed for temporary storage of signal data to be transmitted to the CPU board and control data received from the CPU board.

A test connector (J1) has been included on each of these boards for convenient connection to circuit test points. Pin connections are listed in Figure 3-2.

### **3.4.2. To Test the A/D Board**

To test the A/D Board, a multimeter or logic probe is required.

Each of the fourteen test points on the A/D board will be discussed individually in this section. Refer to Figure 3-2 as required.

1. SIGNAL INPUT FROM PHOTO BOARD identifies that the signals from the ninety-six photodiodes on the photo board are transferred to the A/D board.
2. ANALOG GROUND is the required reference point for testing and operation dealing with test point numbers 1, 3, 5, 7, 9, 10, 11, 12, 13 and 14.

Continuity may be checked between this test point and test point #4 of the photo board.

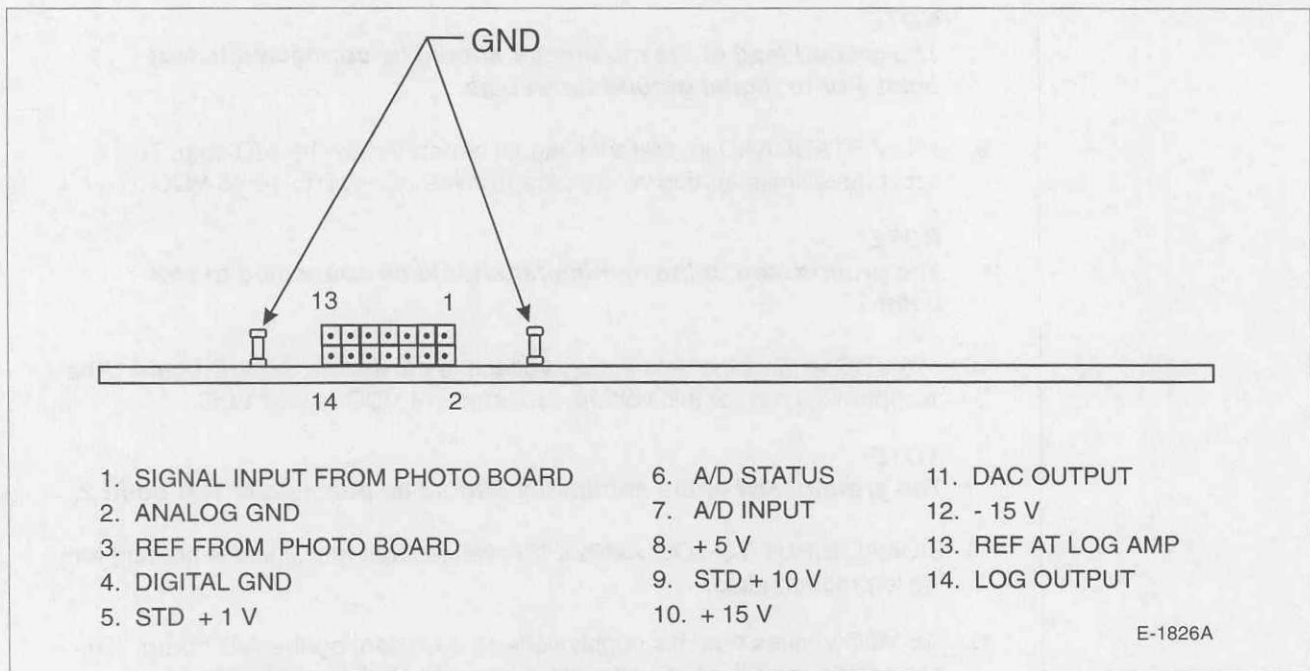


Figure 3-2, A/D Board Test Points

3. REFERENCE INPUT FROM PHOTO BOARD identifies that the reference signal has been transferred to the A/D board.

Access the diagnostics mode of the autoSCAN®-4.

Attach a multimeter to the A/D board to test point #3 with its ground clip connected to test point #2.

By depressing the reference test key #3, 110 mV +/- 10 mV should be observed. R3 of the photo board adjusts the 110 mV level.

**NOTE:**

**110 mV +/- 10 mV should be displayed for the optical filter with the greatest transmittance.**

4. DIGITAL GROUND is the required reference point for testing and operations dealing with test points #6 and #8.

Continuity may be checked between test point #4 and test point #8 on the photo board.

5. 1 VOLT STANDARD verifies that this voltage is being generated on the A/D board. The acceptable limits for this voltage is 1 V + 20 mV.
6. STATUS SIGNAL FROM A/D CHIP verifies that this chip is receiving analog information and has converted this information to a digital form.
7. A/D INPUT SIGNAL indicates that the ratio signal generated from the log ratio module is present at the input to the A/D converter.
8. +5 VDC verifies that this supply voltage is present on the A/D board. The acceptable limits for this voltage are from 4.70 V to 5.30 V.

**NOTE:**

***The ground lead of the multimeter should be connected to test point 4 or to digital ground turret pins.***

9. +10 V STANDARD is reference signal generated by the A/D chip. The acceptable limits for this voltage are from +9.85 VDC to 10.15 VDC.

**NOTE:**

***The ground lead of the multimeter should be connected to test point 2.***

10. +15 VDC verifies that this supply voltage is present on the A/D board. The acceptable limits for this voltage are from +14 VDC to +16 VDC.

**NOTE:**

***The ground lead of the multimeter should be attached to test point 2.***

11. SIGNAL INPUT TO LOG AMPLIFIER verifies that this signal is present for the log ratio module.
12. -15 VDC verifies that this supply voltage is present on the A/D board. The acceptable limits for this voltage are from -14 VDC to -16 VDC.

**NOTE:**

***The ground lead of the multimeter should be attached to test point #2.***

13. REFERENCE INPUT TO LOG AMPLIFIER verifies that this signal is present for the log ratio module.
14. OUTPUT SIGNAL FROM LOG AMPLIFIER verifies that the log ratio module has processed the signal and reference input voltages.

#### **3.4.3 A/D Board Removal**

With the instrument turned off and unplugged, remove the photo board to A/D board cable.

**NOTE:**

***The orientation of the cable to the photo board is critical and when reinstalled must be attached in the same fashion.***

Flip the A/D card eject tabs towards the outside of the board. This should loosen the board from its connector and it will slide out.

## **3.5 CPU Board Subassembly**

### **3.5.1 CPU Board**

The autoSCAN<sup>®</sup>-4 is controlled by the CPU board, which is a Miller Technology Model MCPU-800 on earlier models of the autoSCAN<sup>®</sup>-4. Major circuit elements



include a clock, CPU chip, ROM, RAM and serial and parallel interface. The clock includes crystal Y1, as well as chips U6, U7 and U8. CPU chip U17 is a type Z-80Z. The system uses 4K of ROM with two type 2716's in sockets U28 and U29. It also has 64K of RAM in sockets U14, U15, U19, U20, U25, U31, U35 and U36. The serial interface U21 provides coupling to the main computer at a baud rate of 9600. The parallel interface U9 provides coupling through three 8-bit ports to the circuits of the autoSCAN®-4.

### **3.5.2 CPU Tests**

To check CPU board performance use the diagnostic tests for PROM checksum and RAM tests.

### **3.5.3 CPU Board Removal**

Turn off the instrument and unplug the power cord.

Open the instrument.

Remove the CPU-A/D Board cover if present.

Disconnect the two control cables from the front of the CPU board.

Gently pull the CPU board from its socket.

## **3.6 Color Wheel Subassembly**

### **3.6.1 Introduction**

The color wheel subassembly is responsible for developing the specific spectral wavelengths required for identification and MIC determination on each panel. This subassembly in fact is an abridged spectrophotometer. By utilizing a stepper motor, the color wheel (which contains glass filters of specific spectral transmittance) is rotated by computer control. In this manner, each filter is sequentially placed between lamp source and the common end of the fiber optics. A description of the optical components utilized in the autoSCAN®-4 is listed below. See Figure 3-3.

THE SOURCE is a 85W tungsten halogen lamp. This lamp generates a broad band of energy ranging from approximately 400nm to 2000nm. This range covers all the visible spectrum and a good portion of the infra-red spectrum (IR).

THE HOT MIRROR is a device which rejects all the infra-red energy generated by the lamp while passing visible light. Infra-red energy (heat) is non-useful and potentially harmful to optical components used in this system. See Figure 3-3 for the position of this device in the color wheel housing.

THE CONDENSING LENSES are aspheric glass lens which compress the light output from the lamp to approximately a one-inch cross sectional diameter. See Figure 3-3 for the positions of these devices in the color wheel housing.

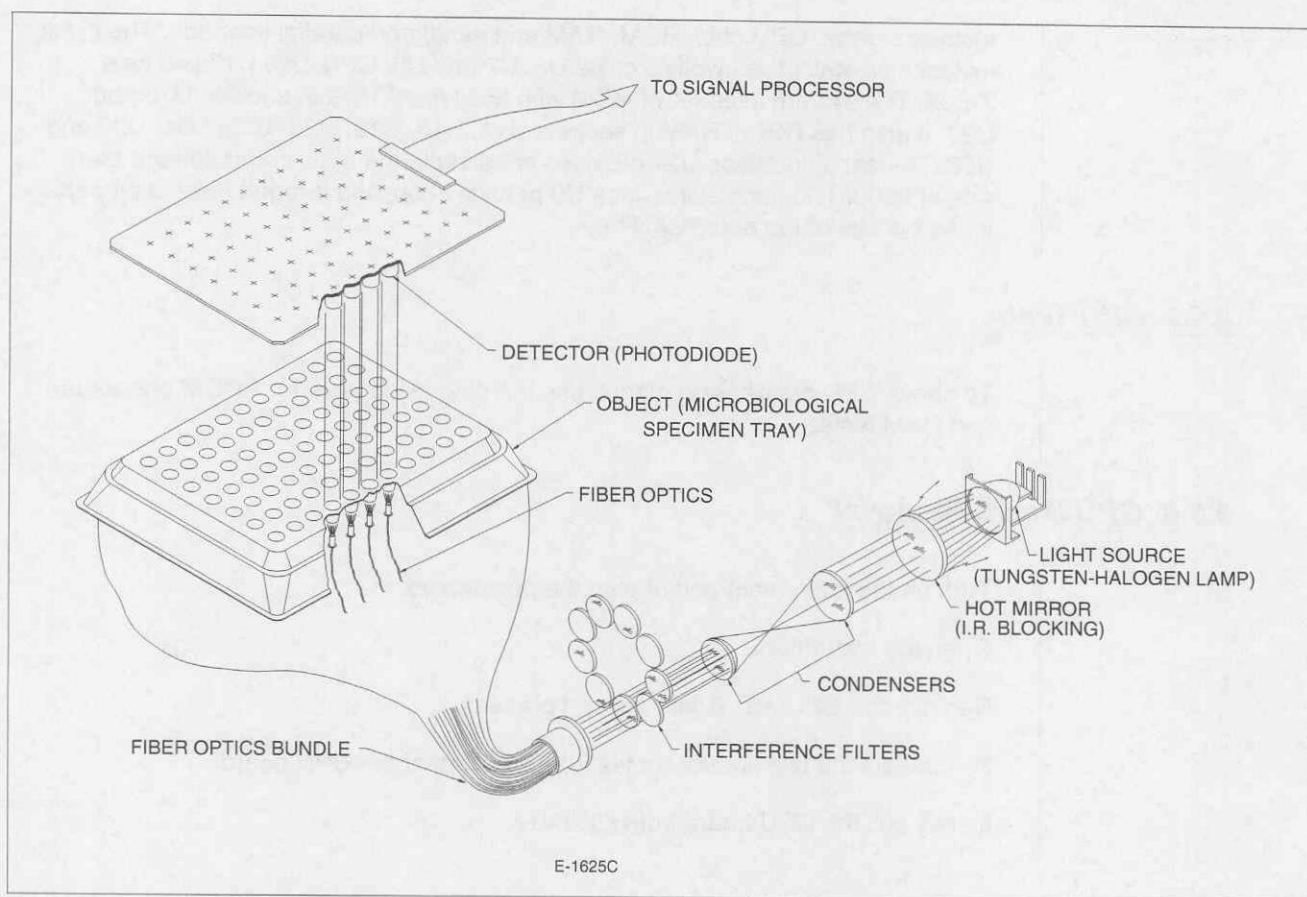


Figure 3-3, Colorimetric Measurement System

THE INTERFERENCE FILTERS are precise glass devices which optically attenuate particular wavelengths or frequencies of light while passing others on with relatively no change. See Figure 3-3 for the position of these devices in the color wheel housing. The light energy from each of these filters is sequentially transmitted through the fiber optics.

#### 3.6.2 Testing

If the color wheel has a suspected fault, there are several key areas that may be investigated to verify that a problem exists.

LIGHT SOURCE FAILURE should be reported to the operator via the computer terminal. The system senses when no light is being transmitted to the photodiode.

Turn the instrument off and allow the bulb to cool for ten minutes prior to attempting to replace it.

If, upon turning the instrument on, the lamp does not activate (this can be seen by observing the scanning indicator on the front of the instrument), then the 12 V line running to the color wheel housing should be checked to verify that this voltage is being supplied to the lamp. Refer to the power board subassembly to make this check.



FAN OPERATION should be periodically checked by the personnel using the instrument to verify that it is functioning. This may be done by placing your hand over the exhaust port out the back of the instrument and noting if warm air is being expelled from the color wheel housing.

If the fan is not expelling warm air from the color wheel housing, check the 12 V line running to the fan. Refer to the power board subassembly to make this check.

THE COLOR WHEEL STEPPER MOTOR function can be checked by accessing the diagnostic mode of the system and depressing the key to step the color wheel through its positions.

If the color wheel stepper motor does not rotate at all when the key is depressed (this can be determined by noting if the scanning indication illuminates or by the audible sound that the motor makes) the color wheel motor drive circuitry should be checked. Refer to the power board subassembly to make this check.

A COLOR WHEEL OPTO-INTERRUPTER malfunction will be obvious if the color wheel does not step through each color in a normal fashion (one at a time) when depressing the color wheel advance key. By removing the front panel of the color wheel housing, the color wheel and opto-interrupter may be seen. See Figure 3-4 for a representation of the correct mounting position of the opto-interrupter.

**NOTE:**

***Do not touch the interference filters. Any foreign substance on the filters will cause premature aging and loss in transmission through the filters.***

If the opto-interrupter appears to be positioned correctly in the color wheel housing, replace the front cover.

Verify that electronic signals are being transmitted to the control board. Refer to the power board subassembly to make this check.

INTERFERENCE FILTER replacement or additions may be done removing the color wheel front panel and removing the ring clip in the filter location of interest with a snap ring tool (Waldes truarc #1120). Remove the O-ring and tap gently on the color wheel. The filter (or slug) should fall out. Reinstall interference filters with the mirrored side facing away from you.

### **3.6.3 Color Wheel Assembly Removal**

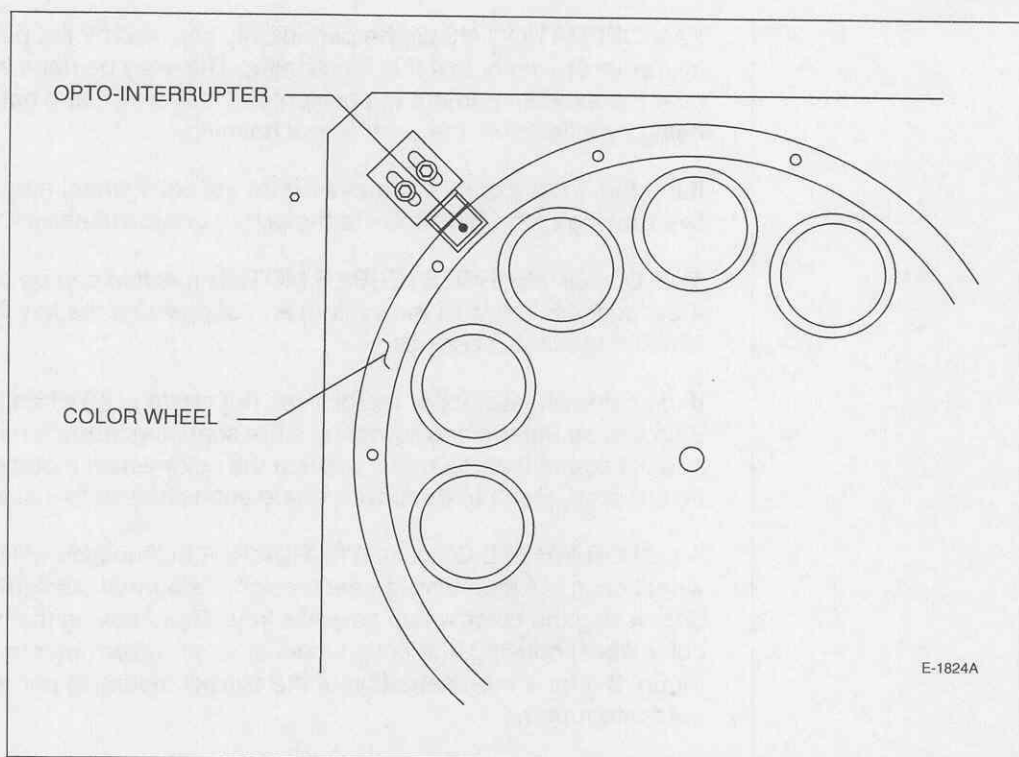
With the power to instrument turned off, disconnect the color wheel/power board cable from the color wheel.

Remove the A/D board from its card slot.

Loosen the four screws which hold the A/D card and CPU board bracket to the color wheel housing. The bracket may now be removed from the color wheel housing.

Disconnect the common end of the fiber optics bundle from the front panel of the color wheel housing.

Figure 3-4, Color  
Wheel Opto  
Mounting



# **Section 4**

## **System Diagnostics Tests**

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### **4.1 Introduction**

The autoSCAN®-4 FSR Diagnostics Tests provide routines for the FSR to troubleshoot problems and to isolate defective components within the system.

### **4.2 Field Service Diagnostics**

The Field Service Diagnostics Tests initially displayed on the screen should be listed as follows:

1. CPU Board
2. Power Supply Voltage Tests
3. Drawer Motion
4. Color Wheel
5. A/D and Photo Boards

Enter selection or ESCape to exit:

Each of these subassembly tests have subsets of tests associated with them. These tests are listed and described in the sections below.

### **4.3 CPU Board Tests**

CPU Board Tests provide four methods of testing this subassembly. They are listed below with an explanation of their purpose.

#### **4.3.1 PROM Checksum**

If the reader program (which controls the internal working functions of the instrument) has been corrupted, the PROM checksum test should indicate this as a failed component. The CPU board should be replaced.

#### **4.3.2 RAM Memory Test**

All panel data gathered by the CPU is temporarily stored in RAM before being sent onto the IBM computer. A failure in RAM components would require replacing the CPU board assembly.

#### **4.3.3 RS-232 Link Test**

This test is to verify that information is being passed from the IBM to the autoSCAN®-4. It will be required for this test to connect the oscilloscope to I.C.

pins inside the reader. Failure in this test could indicate either a faulty RS-232 interconnect cable, IBM computer, power board or CPU board.

## 4.4 Power Supply Voltage Tests

Power Supply Voltage Tests confirm that the voltages to be generated by this assembly are at their proper rating.

### 4.4.1 +5 Volts

If after selecting option 1, the +5 volts is found to be out of range, it may be possible to adjust this supply voltage. A failure in this test would indicate that the power board should be replaced.

**NOTE:**

***Check the Main Power Supply and verify that it is developing 12.3 VDC, measured between TP1 and TP4 on the power board.***

### 4.4.2 -15 Volts

What was stated above for the +5 volts also applies for this supply voltage. The only difference is that by selecting option 2, information regarding the -15 volt supply will be displayed.

### 4.4.3 +15 Volts

What was stated above for +5 volts also applies for this supply voltage. The only difference is that by selecting option 3, information regarding the +15 volt supply will be displayed.

## 4.5 Drawer Motion Tests

Drawer Motion Tests provide four methods of testing the proper functionality of this subassembly. They are listed below with an explanation of their purpose.

### 4.5.1 Close Drawer

If the drawer is open, selecting option 1 should close it.

### 4.5.2 Open Drawer

If the drawer is closed, selecting option 2 should open it.



### **4.5.3 Opto-Interrupter Test**

When the drawer opens or closes, opto-interrupters are tripped so that a feedback signal may be sent to the CPU. This signal indicates that the drawer is in one of its two states.

### **4.5.4 Continuous Motion**

Selecting option 4 will cause the continuous opening and closing of the drawer.

## **4.6 Color Wheel Tests**

Color Wheel Tests indicate that this subassembly is performing to its required specifications. By selecting option 4 these tests will be displayed. They are listed below with an explanation of their purpose.

### **4.6.1 Advance Color Wheel**

Selecting option 1 advances the color wheel from filter to filter. An opto-interrupter is used to send a feedback signal to the CPU when a filter is placed in the correct light path. The CPU then stops the color wheel motor. A failure in this test could indicate either a defective opto-interrupter, motor drive circuitry or mechanical assembly.

### **4.6.2 Home Color Wheel**

Selecting option 2 will advance the color wheel to its home position if it is not already at that point. The same opto-interrupter as described above is used as a feedback device to the CPU Board. The CPU then stops the color wheel motor. A failure in this test could indicate either a defective opto-interrupter, motor drive circuitry or mechanical assembly.

### **4.6.3 Continuous Motion**

If it is desired to rotate the color wheel without having it stop, selecting option 3 will perform this task.

### **4.6.4 Lamp Test**

By selecting option 4, the system will give an indication of whether the lamp is operating or burned out. The color wheel should advance to a designated location and you should observe a color from the scanning indicator. The computer display should also indicate the presence of this light. A failure in this test indicates a defective lamp.

## **4.7 A/D and Photo Board Tests**

Automatic testing and readjustment of the A/D and Photo board are covered in this section. By selecting option 5, these tests will be displayed. They are listed below with an explanation of their purpose.

### **4.7.1 Automatic Test of A/D and Photo Boards**

A series of tests is performed when option 1 is selected. If the displayed message indicates a failure, the photoboard and/or the A/D board needs to be replaced.

If the message is displayed to attach the jumper clip between the designated pins, this must be done to further isolate a problem.

A failure upon resumption of this test indicates a bad A/D board.

### **4.7.2 Reference Fiber Adjustment**

The present signal level that is being generated by the reference circuitry should be displayed on the screen. This signal may also be monitored by attaching a meter to Test Point 13 on the A/D board. This signal level should be 1.10 V plus or minus 10 mV and may be adjusted through the Reference Adjust R3 on the photo board. Press <Enter> to continue on, or <Esc> to stop the adjustment procedure.

### **4.7.3 Calibration and Alignment of A/D and Photoboard**

Selecting option 1 will furnish the correct sequence of adjustments for setting the photo and A/D boards.

#### **4.7.3.1 Preliminary Gain Adjustment**

The present signal level that is being generated by the signal line and DAC circuitry must be monitored at test point 11 on the A/D board. This signal level should be 10.0 V plus or minus 10 mV and may be adjusted through the gain adjustment R4 on the A/D board. Press <Enter> to continue or <Esc> to stop the adjustment procedure.

#### **4.7.3.2 Preliminary Offset Adjustment**

As in the previous step, test point 11 must be monitored. The signal level should be 0.00 V plus or minus 1 mV and may be adjusted through the offset adjustment R3 on the A/D board. Press <Enter> to continue on or <Esc> to stop the adjustment procedure.

#### **4.7.3.3 Final Gain Adjustment**

The present digital signal being generated out of the A/D integrated circuit should be displayed on the screen. The displayed voltage should be 0.0 V plus or minus

2 mV and can be adjusted through the gain adjustment R4 on the A/D board. Press <Enter> to continue on or <Esc> to stop the adjustment procedure.

#### **4.7.3.4 Slope Set Adjustment**

The present signal level out of the log AMP should be currently displayed on the screen. The displayed voltage should be 10 volts plus or minus 4 mVolts and can be adjusted through R36 on the A/D board. Press <Enter> to continue or <Esc> to stop the adjustment procedure.

#### **4.7.3.5 Slope Verify**

The screen should display -10 V with a range of -9.9 V to -10.4 V. No adjustment is required at this step. Press <Enter> to continue or <Esc> to stop the adjustment procedure.

#### **4.7.3.6 Final Offset Adjustment**

The value indicated on the old style offset test panel (identified by the absence of a date code etched in the corner of panel) should be decreased by 223 units to accommodate the 1985 update with the glass diffuser plate.

Adjust R3 on the A/D board to yield the characteristic number provided with your offset test panel. Recalibrate, rerun and readjust if necessary.

### **4.7.4 Gain Adjust**

By selecting option 4, the gain signal level may be checked. The output should be approximately 10 volts.

**NOTE:**

***Close the autoSCAN<sup>®</sup>-4 cover during calibration and panel read.***

### **4.7.5 Offset Adjust**

By selecting option 5, the selections for checking the system signal offset will be displayed.

Option #1 displays the system signal offset. The output should be approximately 0 Volts. Offsets of plus or minus 20 mV are common. If the signal offset is outside these parameters, the A/D and Photo board Calibration Procedures of this section should be performed.

Option #2 provides the means of monitoring and adjusting the system offset by following the instructions displayed on the A/D and Photo board Adjustment Procedure.

**NOTE:**

***Rotating R3 clockwise will decrease the displayed output number, while a counterclockwise adjustment will increase the number.***

### 4.7.6 Test Point Monitoring

This section allows for a thorough check of key electronic areas in the autoSCAN®-4. It will be necessary to set the reference, signal, and DAC values to the desired settings for your tests. By selecting option 6 the means for setting these signals will be displayed. The following tables which refer to the signal and reference voltages are only applicable if the DAC is set to 255. At any other DAC setting, these tables will not be valid nor should they be used.

Option #5 provides the means of running a panel while in the diagnostics mode. The reference signal, however, will be set at the level that was selected earlier in this section.

Option #6 will display all the test points that may be monitored in the system. The color wheel or drawer mechanism may be advanced while monitoring these test points.

**NOTE:**

***The color wheel should always rotate when the drawer opens.***

Table 4.1

SIGNAL AND REFERENCE PARAMETERS  
FOR A/D - PHOTO BOARD CHECKS

<u>Signal Input Voltages</u>	<u>Reference Input Voltages</u>
1. 0.010 volts	1. 0.100 volts
2. 0.100 volts	2. 0.500 volts
3. 1.000 volts	3. 1.000 volts
*4. External input	*4. External input
**5. Normal signal input	***5. Normal reference input

\* External signals may be supplied to designated test points on the photo board . The maximum range of voltages that may be input are 0 volts to +10 volts.

\*\* These selections would simply indicate if actual signals were being developed by the photodiodes. Outputs, if these parameters were selected, would be determined by DAC setting and media in the tray under test or any suitable substitute such as a water blank.

\*\*\* Determined by setting of color wheel.

1. SIGNAL INPUT FROM PHOTO BOARD : The screen should indicate the signal value that was selected from Table 4.1 plus or minus 5% is being received from the photo board . A problem may exist with the photo board if this test fails.
2. ANALOG GROUND: This signal level should be 0 Volts plus or minus 10 mV. Failure in this test could indicate a faulty A/D board.
3. REFERENCE INPUT FROM PHOTO BOARD : This test is similar to test Number 1, but checks the reference line instead.
4. 1 VOLT STANDARD: As with the 10V signal, a 1 volt reference is also generated. This particular voltage level should be 1 volt plus or minus 20 mV.



If this test fails, check the power supply voltages. Also verify that the interconnection to the CPU board is OK. If the test still fails, the A/D is more than likely defective.

5. **+5 VOLTS:** This test verifies that this supply voltage is present on the A/D board. This test may indicate that the +5 volts should be adjusted. If adjustment is not possible, check the power supply voltages. Also check that the interconnections between the power board and A/D board are OK. A failure in this test could indicate a defective power supply, power board, control board or A/D board.
6. **10 VOLT STANDARD:** The analog to digital converter provides the feature of generating a 10 VDC signal. If this test fails, check the power supply voltage. Also verify that the interconnection to the CPU board is OK. If the test still fails, the A/D is more than likely defective.
7. **+15 VOLTS:** This test verifies that this supply voltage is present on the A/D board. The test may indicate that the +15 volts should be adjusted. If adjustment is not possible, check the power supply voltages. Also check that the interconnection between the power board and A/D board is OK. A failure in this test could indicate a defective power supply, power board, control board or A/D board.
8. **DAC OUTPUT:** Depending upon the parameters that were initially set up prior to selecting the A/D Photo Board Tests, various outputs could be visible on the screen. See Table 4.2. An error in this test indicates a defective A/D board.

Table 4.2

SELECTED SIGNAL INPUT	0.010 V	0.100 V	1.000 V
DAC OUTPUT	1.0 V	10.0 V	N/A

(All outputs are specified in volts at plus or minus 10%)

The DAC gain is set at 255 to achieve these values.

9. **2/3 DAC OUTPUT:** This test is similar to the DAC OUTPUT test but checks that the output of the DAC is providing correct signals. Refer to Table 4.3 for these correct outputs.

Table 4.3

SELECTED SIGNAL INPUT	0.010 V	0.100 V
2/3 DAC OUTPUT	.667 V	6.67 V

(All outputs are specified in volts at plus or minus 10%)

10. **-15 VOLTS:** This test verifies that this supply voltage is present on the A/D board. This test may indicate that the -15 volts should be adjusted. If adjustment is not possible, check the power supply voltages. Also check the interconnection between the power board and A/D board is OK. A failure in this test could indicate a defective power supply, power board, control board or A/D board.

11. REFERENCE IN AT LOG AMP: This test is similar to the 2/3 DAC OUTPUT test, but checks the reference line instead. Refer to Table 4.4.

Table 4.4

REF IN AT LOG AMP		
SEL. REF. INPUT	0.100 V	1.0 V
	0.500 V	5.0 V
	1.000 V	10.0 V

(All outputs are specified in volts at plus or minus 5%)

12. 2/3 REFERENCE INPUT TO LOG AMP: This test is similar to the 2/3 DAC OUTPUT test. Refer to Table 4.5 for the correct output.

Table 4.5

2/3 REF INPUT TO LOG AMP		
SEL. REF. INPUT	0.100 V	.667 V
	0.500 V	3.33 V
	1.000 V	6.67 V

(All outputs are specified in volts at plus or minus 5%)

13. LOG AMP OUTPUT: Depending upon the parameters that were initially set up prior to selecting these A/D photo board tests, various outputs could be visible on the screen. See Table 4.6. An error in this test indicates a defective A/D board.

Table 4.6  
LOG AMP OUTPUT

SELECTED SIGNAL INPUT				
SEL. REF. INPUT		0.010	0.100	1.000
	0.100	0 V	+10.0 V	N/A
	0.500	-6.98 V	+3.01 V	N/A
	1.000	-10.0 V	0 V	N/A

(All outputs are specified in volts at plus or minus 1%)

The DAC gain is set at 255 to achieve these values.

14. 2/3 LOG AMP OUTPUT: Depending upon the parameters that were initially set prior to selecting these A/D photo board tests, various outputs could be visible on the screen. See Table 4.7. An error in this test indicates a defective A/D board.

Table 4.7  
2/3 LOG AMP OUTPUT SIGNALS

SELECTED SIGNAL INPUT				
SEL. REF. INPUT		0.010	0.100	1.000
	0.100	0 V	+6.66 V	N/A
	0.500	-4.65 V	+2.01 V	N/A
	1.000	-6.66 V	0 V	N/A

(All outputs are specified in volts at plus or minus 1%)

The DAC gain is set 255 to achieve these values.

15. DAC OFFSET: This test is designed to check the dynamic range of the offset adjustment. The dynamic range of the offset is from -203 mV to +203 mV. If the screen displays a voltage greater than plus or minus 170 mV, a problem may exist on the A/D board.
16. 1 VOLT AT PHOTO BOARD : This test checks for this voltage on the photo board . It should be 1 volt plus or minus 20 mV. If this value is not correct, a problem could exist in the photo board . Also check the photo board to A/D board cable.

DECLASSIFICATION

DATE: 01/15/2025

BY: [illegible]

REASON: [illegible]

EXEMPTION: [illegible]

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE

DATE 01/15/2025 BY [illegible]



# **Section 5**

## **Alignment and Test Procedure**

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### **5.1 Introduction**

#### **5.1.1 Purpose**

To provide written instructions for the repair and alignment of autoSCAN®-4 drawer assemblies, both the original drawer assembly, P/N 9800-0132 (S/N 2172 and earlier) and the newer style drawer assembly, P/N 9800-0740 (S/N 2173 and above).

#### **5.1.2 Scope**

To enable field service personnel to repair all types of autoSCAN®-4 drawer assemblies in a timely and accurate manner.

#### **5.1.3 Preparation**

**NOTE:**

***If linear bearings on the newer style drawer assembly are to be replaced, be sure to order two retaining rings per bearing.***

Easy access to the drawer adjustments and alignments require that the following parts or assemblies be removed:

- a) Photoboard assembly
- b) Diffuser plate and photo diode shield
- c) Photoboard collimation block
- d) Drawer splash guard (plate) and cross brace

Adjustments of drawer assemblies may be made easier with the removal of the color wheel assembly. FSR diagnostics will properly control drawer motion for purposes of drawer alignment with the color wheel assembly removed. This control is also evident with the photo board removed.

Due to its proximity to the drawer, the Power/Controller connector J5 may be difficult to remove or reconnect until the Power/Controller assembly is loosened by removing three screws securing the assembly to the drawer.

#### **5.1.4 autoSCAN®-4 Drawer Assembly Overview**

Two style drawer assemblies exist with autoSCAN®-4 trayreader instruments in use currently in the field. Drawer assembly, P/N 9800-0132, was discontinued in March 1990, and production of the newer style drawer assembly, P/N 9800-0740, was begun in April 1990.

The new drawer assembly, MicroScan P/N 9800-0740, will be installed on all domestic autoSCAN®-4 trayreaders with the serial number 5065 and above. The same new drawer assembly has also been provided on all international autoSCAN®-4 instruments, beginning with serial number 2173. The new drawer assemblies have been produced to provide easier service and alignment.

The new drawer carrier assembly, MicroScan P/N 9800-0737, is the portion of the drawer assembly which carries the tray block and moves in and out of the drawer assembly. It contains four linear bearings which ride on two round guide rails of the drawer assembly.

A new style of drawer open opto flag, two new belts, a floating left guide rail with "wave" washers, and a new idler roller assembly are also components of the new drawer assembly. This new drawer assembly eliminates the eight "V" wheels and the four associated "V" wheel rails found on previously produced autoSCAN®-4 drawer assemblies.

### **5.1.5 Recommended Order of Drawer Alignment and Calibration Procedures**

Identify type of drawer and differences

Initial Testing (Calibration / Repeatability)

Disassembly (To Required Level)

Aperture Plate Shoulder Screw Examination / Clearance Setting

Aperture Plate Spring Tension Examination and Adjustment

Aperture Plate Solenoid and Plunger Examination / Adjustment

Drawer Mechanical Linkage Examination / Adjustment

\* Drawer Carriage Height Examination / Adjustment

Guide Rail Height Adjustment (New Style Drawer)

"V" Wheel Adjustment (Old Style Drawer)

\* Drawer Closed Opto Adjustment (Drawer Closed Tension)

Spring Tensioner (New Style Drawer)

Gear Rack Springs (Old Style Drawer)

Drawer Open Opto Adjustment

Drawer Carriage Position Alignment (Block / Pins)

(Drawer Carriage to seat against the Tooling Balls)

Photo diode Collimation Block Alignment (Block / Pins)

Fiber Optics Well Cleaning

\* Nylon Drive Gear and Gear Rack Orientation (Old drawer only)

Reassembly

Electrical Adjustments

Reference Fiber Voltage Adjustment

Calibration and Alignment of Photo Board / A/D PCB

System Calibration

Repeatability

Water Blank

**(\*) Indicates adjustments differ between old and new drawers**

#### Equipment Required:

New drawer alignment fixture with alignment pins P/N 5400-1665 and 5400-1666 (pins)

Jumper cable for locking aperture plate P/N 9800-1238  
Repeatability panel P/N 9800-0767 (case of 72 panels)  
Water Blank panels P/N 3280-1160  
Set of Hex wrenches  
Flat blade screw driver  
Feeler gauge  
New Style Drawer assembly drawing, P/N 9900-0740  
New Style Drawer carrier assembly drawing, P/N 9900-0737  
Original Drawer assembly drawing, P/N 9900-0132

## **5.2 Replacement Part Procedures**

### **5.2.1 Aperture Plate Replacement**

**NOTE:**

***It is only necessary to remove and replace the aperture plate when aperture plate malfunction is suspected by previous diagnostic testing. Servicing the aperture plate does not necessitate a complete drawer alignment.***

1. Remove the four aperture plate shoulder screws. (If these screws are difficult to remove, heat the screws to loosen the locktite securing these screws and remove carefully.)
2. Remove the solenoid mounting bracket by removing the two screws that secure it. Loosen the nut securing the solenoid to the solenoid mounting bracket.
3. Lift out the aperture plate and plunger.
4. Ensure that the top of the aperture plate solenoid plunger has been cut at an angle, or cut off completely at the plunger roll pin.

**NOTE:**

***If it has not been cut, order and replace the aperture solenoid (it comes with a new cut plunger) P/N 3101-3102. If the new solenoid plunger has a "C" clip installed on it, remove it at this time (it should be installed). Ensuring that the plunger is cut at an angle will prevent it from coming into contact with a panel when the tray block is pulled into the drawer assembly.***

5. Place one drop of (removable) Locktite 242 into each of the aperture plate shoulder screw holes.
6. Carefully remove any excess locktite from the surface of the holes.
7. Temporarily, without aperture plate, screw the shoulder screws into the fiber block to force excess locktite to ooze from the holes.
8. Remove any excess locktite that may have oozed out of the holes and around the screws.

**NOTE:**

***These precautions are necessary to prevent the aperture plate from sticking to the fiber bundle block, due to excess locktite on the mating surfaces.***

9. Remove the shoulder screws, and prepare to mount the aperture plate.
10. Inspect the replacement aperture plate for defects (irregular slotted holes, warpedness, plugged holes, etc.). Ensure the aperture plate is clean of oil, grease, or debris.
11. Reinstall the solenoid to its mounting bracket and secure with the solenoid nut. It will be necessary to mount the aperture plate into position before positioning and tightening the solenoid mounting bracket into place.
12. Replace the aperture plate, plunger and spring onto the fiber bundle block, and secure with the shoulder screws.

**NOTE:**

***It is recommended that the shoulder screws be replaced at the same time as the aperture plate, as the metal of the screws may have become fatigued during removal and may break during reassembly, forcing the replacement of the fiber bundle block.***

13. Adjust the shoulder screws to provide approximately 0.010" to 0.012" clearance between the top of the aperture plate and the bottom of the head of the aperture plate shoulder screws.
14. Loosely mount the aperture solenoid with its mounting bracket to the fiber bundle block. Ensure the solenoid mounting bracket has flat washers between it and the fiber bundle block and the retaining screws have split lock washers.
15. Position and tighten the solenoid mounting bracket with the solenoid's plunger pressed into the solenoid. This will help ensure the plunger to solenoid alignment necessary to prevent binding and restriction of aperture plate movement due to misalignment of the solenoid to the plunger.
16. Check for proper aperture plate solenoid spring tension and freedom of aperture plate movement.

**NOTE:**

***Manually pull the aperture plate in, and very slowly release it. A weak spring may not completely return and hold the aperture plate in its resting position against the aperture plate shoulder screws. Conversely, excessive spring tension will not allow the aperture solenoid to pull in the aperture plate.***

### **5.2.2 Belts (New Style Drawer)**

1. Loosen the dual pulley, located front top right hand side.
2. Push the pulley towards the back of drawer assembly.



3. Loosen the idler assembly, twist down so that idler is not making contact with belt.
4. Remove the belt clamp.
5. Remove both belts, removing the top belt first.
6. Replace the belts, installing the top belt last.
7. Push the dual pulley toward the front of drawer assembly, applying tension on the belt. Ensure the idler assembly is not making contact with the belt at this time.
8. Tighten the dual pulley.
9. Twist the idler assembly counterclockwise until idler applies tension on the belt. Too little tension will cause the motor to spin too freely, with loss of motor synchronization. Too much tension will cause excessive noise and bearing wear during drawer motion.
10. Tighten the idler set screw.
11. Install the belt clamp.
12. Apply power to the autoSCAN®-4.
13. From the Trayread program in DMS, enter the Field Service Diagnostics program.
14. Select option 3, drawer motion.
15. Select option 4, continuous motion.
16. Select an interval time of 3 seconds.
17. Verify drawer tension, when the drawer is closed.

**NOTE:**

***This spring tension (loading) should cause the plate tensioner to move approximately halfway along its total possible travel. To verify close the drawer using the "Close Drawer" command in diagnostics. Watch the plate tensioner as you turn off the power to the instrument. A small amount of movement should be noticed from the plate tensioner. Adjust the opto-interrupter, as necessary. (See Section 5.3.3)***

18. Verify drawer position, when drawer is open. The drawer carriage should not contact the drawer light shield when the drawer is open. Adjust the opto-interrupters, as necessary.

**5.2.3 Linear Bearing (New Style Drawer)****NOTE:**

***Be careful of wave washers, they fall out easily. Refer to drawer assembly drawing, (Drawing #9900-0740, Bubble #74), if necessary.***

**Remove drawer carriage assembly,** P/N 9800-0737:

1. Loosen left front shaft support bracket and remove.
2. Remove the two wave washers, (Drawing #9900-0740, Bubble #74).
3. Remove left rear shaft "E" ring.
4. Remove the two wave washers, (Drawing #9900-0740, Bubble #74), from left rear shaft.
5. Slide left shaft out.
6. Loosen the locking screws located at both the front and rear right side rail support brackets.
7. Slide right shaft out.
8. Remove the two screws that secure the belt clamp.
9. Remove the belt clamp.
10. Lift the left side of carriage assembly to 45 degrees to remove the carriage assembly. Remove belt bracket, if needed.

**Remove linear bearing(s) to be replaced.**

**NOTE:**

***Be sure to have two retaining rings for each linear bearing to be replaced. The retaining rings will be damaged and be unusable after removal.***

11. Use a flat blade screwdriver to remove the retaining rings.
12. Tap out the linear bearing from one side with an 11/32" nut driver.
13. Install the new linear bearing and new linear bearing retaining rings.

**Install drawer carriage assembly**

14. Install the right shaft, and tighten both front and rear locking screws.
15. Slide left shaft through both left carriage linear bearings.
16. Install wave washers on left rear shaft. Refer to drawing, (Drawing #9900-0740, Bubble #74).
17. Install "E" ring on left rear shaft.
18. Position shaft into rear support bracket.
19. Install wave washers on left front shaft. Refer to drawing, (Drawing #9900-0740, Bubble #74).
20. Slide front left shaft support bracket onto shaft.
21. Install front left shaft support retaining screws.

22. Continue with guide rail alignment procedure in Section 5.3.2.1.

## **5.3 Mechanical Alignments**

### **5.3.1 Mechanical Verification**

Prior to verifying/adjusting drawer alignment, the following mechanical checks should be performed:

- a) Ensure proper aperture plate to shoulder screw clearance.

The clearance between the top of the aperture plate and the bottom of the head of the aperture plate shoulder screws should be approximately 0.010" to 0.012".

- b) Ensure proper aperture plate solenoid spring tension.

Manually pull the aperture plate in, and very slowly release it. A weak spring may not completely return and hold the aperture plate in its resting position against the aperture plate screws. Conversely, excessive spring tension will not allow the aperture solenoid to pull in the aperture plate.

- c) Ensure proper drawer pulley belt tension.

Too little tension will cause the motor to spin too freely, with loss of motor synchronization. Too much tension will cause excessive noise and bearing wear during drawer motion.

- d) Ensure snug mechanical linkage.

The mechanical linkage (pulley gears, pulley gear set screws) between the drawer motor and drawer carrier should be snug (no loose screws).

- e) Ensure drawer spring tension (closed position).

Ensure spring tension (loading) occurs when the drawer is powered into the closed position. The plate tensioner (or gear racks) should move approximately halfway along the total possible travel as the drawer completes its closed position motion. When powered in the closed position, a small amount of plate tensioner or gear rack release will be noticed at the moment power is removed.

- f) Ensure drawer is on a level plane and at the proper height. Depending on the type of drawer assembly being serviced, one of two procedures (Section 5.3.2.1 or 5.3.2.2) on the following pages must be performed to ensure the drawer is level and does not bind during its full length of travel.

### **5.3.2 Drawer Carriage Height Examination and Adjustment**

**Objective:** Achieve a level plane for drawer carrier.

### **5.3.2.1 Guide Rail Adjustment (New Style Drawer)**

It is required that the guide rails be parallel to each other and the same height during these adjustments. To achieve a level drawer carrier assembly as it travels the full length of the rails, and to provide a drawer position requiring minimal adjustment in the subsequent drawer alignment, the initial adjustments will place:

- a) the top of the front rail brackets approximately 3 3/8" (86mm) from the top of the drawer side plate, and . . .
- b) the top of the rear rail brackets approximately 2 27/32" (72mm) from the top of the drawer side plate.

**If the above criteria are not met, perform the following steps:**

1. Remove the belt clamp, and loosen all four sets of shaft support bracket screws so that all four support brackets move up and down freely in slots.
2. Adjust the left front rail support bracket to obtain the proper height and tighten both bracket adjustment screws.
3. Adjust the right front rail support bracket to obtain the proper height and tighten both bracket adjustment screws.
4. Adjust the left rear rail support bracket to obtain the proper height and tighten both bracket adjustment screws.
5. Adjust the right rear rail support bracket to obtain the proper height and tighten both bracket adjustment screws.
- 6.. Install belt clamp.

**CAUTION:**

***If the drawer height was adjusted, it may be necessary to reposition the drawer open and closed opto-interrupters or flags. The opto-interrupter could be DAMAGED. See Sections 5.3.3 and 5.3.4 for information on how to adjust the drawer opto-interrupters or flags.***

### **5.3.2.2 "V" Wheel Adjustment (Old Style Drawer)**

- a) Ensure that no excess wear occurs on the "V" wheels and their associated rails.
- b) Ensure proper engagement between the delrin drive gears and the drawer gear racks, so that no binding occurs.
- c) Ensure the drawer is on a level plane, referenced to the drawer frame.

**If the above criteria are not met, perform the following steps:**

1. Remove the drawer pulley belt.
2. Remove the drawer carriage assembly and adjust the eccentrics on the 4 lower "V" wheels so that the carriage will set at its lowest point.



**NOTE:**

***This will also ensure that the gear racks are not pressed tightly against the delrin drive gears. Some additional adjustment may be necessary to ensure that the drawer sits in a level position.***

3. While the drawer carriage is removed, clean any contamination that may be present on the drawer rails and "V" wheels.

**NOTE:**

***Ensure that each of the eight (8) "V" wheels rotate without binding. If the "V" wheels bind, it may be necessary to remove the "V" wheels and reposition the shims that separate the "V" wheels from the drawer carriage so that the shims do not rub against the rotating "V" wheels. A slight amount of super glue will hold the shims together and in place on the drawer carriage when remounting the "V" wheels to the drawer carriage. If "V" wheels continue to bind, it may be necessary to replace the "V" wheel (P/N 5636-1001, Bubble #46) and its associated Bushing Bearing Adapter (P/N 5633-0102, Bubble #42).***

4. Ensure the drawer carriage is level by measuring the gap between the top of the upper "V" wheel rails and the bottom of the two gear racks, at the four corners of the drawer carriage assembly. The gap should be approximately 0.060" +/- 0.010". Make any adjustments to the wheel eccentrics as necessary, ensuring the original three adjustment objectives are met.
5. Adjust the eccentrics on the 4 upper "V" wheels at each of the four corners of the drawer carriage to reduce the gap between the upper wheels and the upper rails.

**NOTE:**

***Do not close the gap completely; this will cause excessive wear to the "V" wheels, "V" wheel bearings, and rails.***

***When the proper amount of clearance is obtained, only one "V" wheel at each of the four corners of the drawer carriage assembly will be in contact with either the upper or lower rail at any given time. When lifting and pushing down on each of the four corners of the drawer carriage assembly, you should feel and see some play (gap) between the "V" wheels and the rails.***

6. Verify that the drawer carriage assembly moves very easily in and out of the drawer assembly, with no binds or friction noted (with drawer pulley belt previously removed).
7. Verify that the drawer front support block with its 2 detents seats against the 2 front tooling balls smoothly and without shifting.
8. Reinstall the drawer pulley belt and idler roller bearing.

### **5.3.3 "Drawer Closed" Opto-Interrupter Adjustment**

1. Adjust the height of the opto-interrupter to allow the "drawer closed" pin to be centered in the opto-interrupter when the drawer is closed.
2. Adjust the forward/backward position of the opto-interrupter so when the drawer carrier is closed, there will be spring tension loaded against the drawer assembly.

**NOTE:**

***This spring tension (loading) should cause the plate tensioner (or gear racks) to move approximately halfway along the total possible travel as the drawer completes its closed position motion. To verify close the drawer using the "Close Drawer" command in diagnostics. Watch the plate tensioner (New Style) or the gear rack (Old Style) as you turn off the power to the instrument. A small amount of movement should be noticed from either the plate tensioner or the gear rack.***

3. Tighten the opto-interrupter adjustment screws.

### **5.3.4 "Drawer Open" Opto-interrupter Adjustment**

1. Adjust the height of the opto-interrupter to allow the drawer flag to be centered in the opto-interrupter when the drawer is open.
- 2a. NEW STYLE DRAWER: Adjust the forward/backward position of the opto-interrupter to adjust the stop position of the drawer when it opens.

**OR**

- 2b. OLD STYLE DRAWER: Adjust the forward/backward position of the drawer open flag, which is mounted on the drawer carriage assembly, to adjust the stop position of the drawer when it opens.
3. Tighten the opto-interrupter or drawer open flag adjustment screws.
4. Move drawer out manually, and ensure front opto flag is centered in drawer open opto-interrupter. Adjust, if necessary.
5. Move drawer in manually, and ensure rear opto pin is centered in drawer closed opto-interrupter. Adjust, if necessary.
6. Verify through FSR Diagnostics, Drawer Motion, Opto-interrupter tests, that both opto-interrupters function properly, and will not change states easily by slight movements applied to the drawer carriage/tray block assembly.

### **5.3.5 Color Wheel Opto-Interrupter Adjustment**

1. Using a DMM, connect the test leads between TP1 and Pin 2 of J3 (top middle white wire) on the power board. This will monitor the output voltage of the color wheel home position opto-interrupter.

The voltage will normally be 0 volts and should be no greater than 0.5 volts in all filter positions except the "Home" position which should measure approximately 4.5 volts. Adjust the opto by moving it inward or outward from the edge of the color wheel to obtain this criteria.

2. Connect the DVM's test leads between TP1 and pin 7 of J3 on the Power Board. This will monitor the output of the color wheel "On-Color" position opto-interrupters. The voltage at all filter positions, including the home position, should be approximately 4.5 volts. The voltage when the color wheel is in between filter positions should be approximately 0 volts.
3. If either measurement is out of adjustment remove the fiber bundle from the color wheel housing and remove the front cover. This will give you access to the opto-interrupter. Move the opto until both the "On-Color" and the "Home" alignments are met. (Both opto-interrupters are in the same housing).

**NOTE:**

***Ensure the light beam is centered within each filter. This adjustment is also achieved by positioning the opto-interrupter.***

These adjustments will ensure the instrument's color wheel will not misinterpret a filter position for the home position and ensures no blockage of light by a mispositioned filter, which would cause an incorrect instrument calibration and possible panel misreads.

4. Reassemble the color wheel housing.

### **5.3.6 Drawer Optical Alignment Verification**

Easy access to the drawer adjustments and alignments require that the following parts or assemblies be removed:

- a) Photoboard assembly
- b) Diffuser plate and photo diode shield
- c) Photoboard collimation block
1. Attach the Drawer Interface Cable Assembly, P/N 9800-1238, between J2 of the Power Board assembly and P2 connector leading to the drawer assembly.
2. Attach the loose clip lead of the Drawer Interface Cable Assembly to TP1 (Ground) of the Power Board Assembly.

**NOTE:**

***This Drawer Interface Cable and associated clip lead is used to electrically pull in the aperture plate solenoid.***

3. Apply power to the autoSCAN®-4. The aperture plate should pull into the small aperture position immediately.

**CAUTION:**

*It is recommended that the aperture plate not be left in the energized state for longer than 15 minutes at a time. The solenoid will get very hot and may be **DAMAGED** from overheating should it remain energized for long periods of time.*

4. From the Trayread program in DMS, enter the Field Service Diagnostic program, and select option 3, Drawer motion.
5. Select option 1, Close drawer.
6. Position the drawer alignment block on top of the tray block, and while holding the alignment jig flat and square on the tray block, place the alignment pins through the alignment block, through the tray block, and into the small apertures.

**NOTE:**

*If the alignment pins **DO NOT align** to the small aperture holes, continue with the Drawer Optical Alignment Adjustments beginning in Section 5.3.7.*

*If the alignment pins **ALIGN** and fit into the small aperture hole position, continue with step 7 of Section 5.3.7 to align the collimation block.*

### **5.3.7 Drawer Optical Alignment Adjustment**

#### **Alignment Objective Summary**

**Reminder:**

*The rear tooling ball should be permanently removed from all **New Style Drawer assemblies**.*

- \* The drawer carrier assembly has either:
    - a. Two machined detents, both at the front located on the Drawer Front Support Block (New Style Drawer).
    - b. Three machined detents, one at the rear of the drawer carriage assembly and two on the Drawer Front Support Block (Old Style Drawer).
- These detents should seat completely against the tooling balls located on the fiber bundle block.
- \* Initially the drawer carrier is aligned with the alignment block to the small holes of the aperture plate. Then the collimation block will be aligned to the aperture plate.
  - \* When the drawer carrier is aligned the pins will fall easily through the collimation block, alignment block, and into the small holes on the aperture plate.

If these Alignment Objectives are not met, the following drawer optical alignment adjustments must be performed.



**NOTE:**

*In order to perform proper drawer optical alignment adjustments, it is important to be familiar with the Drawer Positioning Components. Proper drawer optical alignment is obtained through the correct positioning and adjustment of the following components:*

**NEW STYLE**

- a) Drawer Front Support Block and its two mounting screws  
Drawing 9900-0737, Bubble #9 (Block) and #15 (Screws).
- b) Tray Block Support Plate and its four mounting screws  
Drawing 9900-0737, Bubble #8 (Plate) and #16 (Screws).

**OLD STYLE**

- a) Drawer Front Support Block and its two mounting screws  
Drawing 9900-0132, Bubble #12 (Block) and #80 (Screws).
- b) Tray Block Support Plate and its four mounting screws  
Drawing 9900-0132, Bubble #19 (Plate) and #82 (Screws).
- c) Tooling Ball Bracket and its one mounting screw  
Drawing 9900-0132, Bubble #30 (Bracket) and #81 (Screw).
- d) Tooling Ball, Tooling Ball Position Screw, and set screw  
Drawing 9900-0132, Bubble #47 (Tooling Ball), Bubble #57 (Tooling Ball Position Screw), and Bubble #56 (Set Screw).

For the purposes of Drawer Optical Alignment, the bubble numbers and components referred to in drawings 9900-0737, 9900-0740 and 9900-0132 are applicable.

**Procedure:**

1. To aid in the drawer alignment and help the pins to fall freely through the block, slightly loosen the four screws that secure the Tray Block Support Plate and the two screws that secure the Drawer Front Support Block.
2. OLD STYLE DRAWER: Adjust the rear tooling ball bracket and move the tooling ball (towards the rear of the instrument) to provide initial free clearance, as required to help the pins fall freely through the block.

**NOTE:**

*It may be necessary to move the rear drawer opto-interrupter further back in order to move the carrier further back. Ensure the drawer continues to have spring tension holding the drawer in the closed position. This spring tension (loading) should cause the plate tensioner (or gear racks) to move approximately halfway along the total possible travel as the drawer completes its closed position motion. When powered in the closed position, a small amount of plate tensioner or gear rack release will be noticed at the moment power is removed.*

3. After inserting the alignment pins through the alignment jig and into the small aperture hole position, the pins should help to fix and maintain a drawer carrier position which will allow the subsequent adjustments to be made:

- a) OLD STYLE DRAWER: Center position the rear tooling ball to the rear drawer carriage detent (via positioning the rear tooling ball mounting bracket)

**NOTE:**

***It may be necessary to move the rear tooling ball forward enough to engage the drawer carriage detent in order to determine that the tooling ball is centered in the detent. Afterwards, the tooling ball may be repositioned per the following step.***

- b) OLD STYLE DRAWER: Establish light contact between the rear tooling ball and the rear drawer carrier detent (via loosening the small Allen set screw and adjusting the tooling ball position Allen screw)
  - c) Adjusting the position of the Drawer Front Support Block so that its detents are centered and establishing light contact with the Fiber Bundle Block's tooling balls. Ensure this centering and contact with the tooling balls by wiggling the Drawer Front Support Block from side to side. The front of the drawer carriage should not move to either side easily.
4. When all tooling balls are centered and in contact with their associated detents AND the alignment pins continue to fall freely through the drawer carrier assembly into the small aperture position, slowly and carefully tighten all screws to fix the drawer's position. Continue to verify that the pins fall freely.

**NOTE:**

***Care must be taken while tightening the screws. Two misadjustments may occur during the tightening of the screws:***

- a) The drawer may be pulled out and misaligned while the screws are being tightened.
  - b) The drawer carriage detents may not seat against the front tooling balls completely, which would allow side to side movement of the front of the drawer to occur when the drawer is in the closed position.
5. When satisfied with the initial alignment, remove the drawer alignment pins, and use the drawer motion diagnostics to move the drawer out and in several times.
  6. Close the drawer and ensure that the drawer alignment remains intact. Verify with the alignment block and pins. Readjust the drawer, as required.
  7. Remove the alignment pins only, and loosely install the collimation block. Loosen the side mounting screws for the "L" brackets to which the collimation block mounts, position the "L" brackets to their lowest position and retighten the screws. This will ensure the "L" brackets and the collimation block are in a level position.

**NOTE:**

***While adjusting and tightening the collimation block, the edge of the screws may "seek" the indentation caused by the screws tightened under the previous alignment. The screws might also fall into the edges of the holes in the "L" brackets. Flat washers installed under these screws will eliminate this effect.***

8. Place the alignment pins through the collimation block and adjust the collimation block so that the alignment pins fall through the alignment block and into the small aperture holes.
9. Slowly and carefully tighten each of the four screws that secure the collimation block, ensuring that the alignment pins continue to fall through.
10. Remove the drawer alignment pins, and use the drawer motion diagnostics to move the drawer out and in several times.
11. Close the drawer and ensure that the drawer alignment remains intact. Verify with the alignment block and pins. Readjust the drawer, as required.
12. When satisfied with the drawer alignment, remove the drawer alignment pins and block.
13. Remove power from the instrument and detach the Drawer Interface Cable Assembly, P/N 9800-1238, from between J2 of the Power Board assembly and P2 connector leading to the drawer assembly. Reattach the P2 connector to J2 of the Power Board assembly.
14. Remove the loose clip lead of the Drawer Interface Cable Assembly from TP1 (Ground) of the Power Board Assembly.
15. Use compressed air to remove any contamination, dust or particles that may have fallen into the fiber bundle block.
16. Power on the autoSCAN®-4 and enter the Reference Fiber Adjustment option in Diagnostics. Close the drawer and select one of the optic filters. Now you can visually inspect/clean each well position and reference fiber position. (Cleaning: apply a small amount of lens cleaner to a Q-tip and swab contaminated position, problem positions and reference fiber positions.)

### **5.3.8 Delrin Drive Gear to Rack Alignment (Old Style Drawer)**

1. Observe the drawer as it seats against the front tooling balls. If it shifts to the right or left when seating against the tooling balls, the delrin gears may not be synchronized. (Another cause may be that front block support may not be adjusted correctly. This can be checked by verifying the drawer optical alignment with the alignment fixture and pins. See Section 5.3.6.)

This effect is due to the orientation of the delrin drive gears to the drawer carriage gear racks. (One gear being slightly advanced or retarded than the other gear.)

**NOTE:**

***If the drawer carriage shifts to the left when seating against the tooling balls, the drawer must be slightly shifted to the right during its travel. In this case, the right delrin drive gear's tooth orientation is more advanced than the left nylon drive gear's tooth orientation.***

2. To correct this condition, it is necessary to loosen one of the delrin drive gears, orient and tighten it off of the flat of the drive shaft, so that the drawer carriage assembly is pulled into the drawer assembly at a straight angle.



Performing this adjustment will help ensure the drawer alignment remains intact over the long term use of the instrument.

3. If any adjustments are made it is important to verify the drawer optical alignment using the drawer alignment block and pins. (See Section 5.3.6)

## **5.4 Electrical Adjustments and Calibration**

### **NOTE:**

***Clean and install the photo diode shield and diffuser plate (ensure clips are on correctly). Replace photo board and cover plate, and any other components previously removed.***

### **5.4.1 Power Supply Adjustments**

#### **NOTE:**

***There is one main power supply in the autoSCAN®-4 instrument and it is not monitored by the system diagnostics. This power supply directly supplies voltage for the power board and the tungsten halogen lamp (the starting point for the entire optical reading system). This power supply must be set properly to ensure the validity of all remaining adjustments. (The power board generates +5, +15, and -15 from the 12.3 supplied voltage.)***

1. Apply power to the instrument, and verify the main power supply voltage.
2. Ensure that the main 12 volt power supply has been adjusted to 12.3 volts +/- 0.05 volts, as measured on the power board between TP1 (ground) and TP4 (12 volts).
3. If adjustment is needed, locate R26 (New Style Power Supply) or R25 (Old Style Power Supply) on the 12 volt power supply. The power supply is located under the cooling shroud at the front of the instrument. To access the power supply remove the front drawer panel, stainless steel splash guard, enclosure bottom cross brace and the cooling shroud. The pot is located near the center of the board.
4. Adjust the power supply for 12.3 volts between TP1 and TP4 located on the power board. Replace parts removed in the previous step.
5. Power on the autoSCAN®-4. Enter FSR Diagnostics and select the Power Supply Voltage test. Verify and adjust as necessary (+5, +15, -15) on the power board.

### **5.4.2 Reference Fiber Voltage Adjustment**

1. Examine the interior of the color wheel housing by removing the A/D PCB, CPU-A/D mounting bracket, top cover and the front plate (where the fiber bundle attaches). Check the following:



- a) Lamp wires should be secured away from the front of the lamp by a cable clamp. If not, replace cable clamp and secure the wires away from the lamp.
- b) The interior of the color wheel housing, including the lamp, optical lenses, hot mirror, is clean and dust free.
- c) Using FSR Diagnostics, color wheel option, examine each of the filters, by advancing to each filter position. Many defects or contaminants can be observed with light of the color wheel lamp shining through the filters.

**NOTE:**

***Look for delamination, "star" patterns (white light specks), and any dust or contamination on the filters. Replace any filters that cannot be cleaned with lens cleaner and paper.***

***The non-filter positions have blank slugs that are thinner than the filters in other filter positions. The thinner blank slugs are secured very loosely by the combination of the O-rings and the normal seating position of the filter ring clips and may cause a "rattling" sound during color wheel rotation.***

***It is possible to quiet these "slug" positions by securing the filter ring clips against the rubber O-rings beyond their normal grooved seating position. The clips will not fall out of this "non-grooved" position, and the color wheel noise will be considerably reduced.***

- 2. Within FSR diagnostics, perform the Reference Fiber Adjustment. Ensure the drawer is closed while advancing the color wheel to each filter position. Adjust R3 on the photo board for a displayed voltage of 1.1 +/- 0.01 volts on the filter with the highest output.

The filter with the highest output must be one of the first two filters (620nm or 560nm). If this is not the case, all filters must be reexamined and/or replaced until one of the first two filters become the one with the highest output.

### **5.4.3 Calibration and Alignment of A/D Board**

- 1. Within FSR diagnostics, select Calibration and Alignment of A/D and Photo Board. Perform the following adjustments as prompted by the screen.
  - a) Perform the Preliminary Gain Adjustment  
10.0 +/- 0.01 volts - Adjust R4 on the A/D Board
  - b) Perform the Preliminary Offset Adjustment  
0.000 +/- 0.002 volts - Adjust R3 on the A/D Board
  - c) Perform the Final Gain Adjustment  
0.000 +/- 0.002 volts - Adjust R4 on the A/D Board
  - d) Perform the Slope Set Adjustment  
Toggle between 9.995 and 10.000 volts - Adjust R36 on the A/D Board
  - e) Slope Verify- Should be between -9.9 to -10.4 volts

2. Perform Final Offset Adjustment
  - a) Select the Calibrate option. The drawer should be empty. Press the Read button on the autoSCAN®-4 and the instrument will perform the calibration sequence. Following the sequence the drawer will open.
  - b) Establish the target value for your Offset Test Panel:  
OLD STYLE Offset Test Panel - (No date etched in the corner of panel)  
Subtract 223 from the value etched in one corner of the panel.  
NEW STYLE Offset Test Panel - (Has a date etched in corner with target value) Target value is the number etched in the corner, do not subtract 223.
  - c) Select Read Offset Test Panel. Place the Offset Test Panel on the drawer, press the Read button and follow the instructions on the screen. Adjust R3 on the A/D board for the proper read value of the Offset Test Panel. This is not an active screen so, adjust the pot and reread the Offset Test Panel.
  - d) Offset Test Panel results should be within 20 units of target value.
3. Exit FSR Diagnostics. Perform an instrument calibration in the Read Panels option of DMS. Print results when prompted, "Print Calibration Results".
  - a) Verify the first six filters have calibration values of approximately 3600 units.
  - b) Verify that the seventh filter (590nm with aperture plate) has a calibration value of approximately 3100 units.
  - c) Verify that the DAC gain values for all filters are less than 235 units. If more than 1/2 of the values in the field are over 150 then check the following note.

**NOTE:**

**High DAC gain values are an indication of weak light output received at the photo board. Causes include:**

- a) Low 12 volt supply voltage
- b) Weak lamp (may need to be replaced)
- c) Obstruction of light output within color wheel housing
- d) Bad calibration caused by misadjusted color wheel opto-interrupters
- e) Possible damaged light fibers
- f) Contamination within fiber block wells
- g) Contamination on photo diode shield or diffuser plate
- h) Bad photo diode(s) - replace photo board

## 5.5 Repeatability

The autoSCAN®-4 repeatability test is intended to be used as a diagnostic tool for verifying the mechanical ability of the autoSCAN®-4 to accurately repeat panel readings. This must be performed after the autoSCAN®-4 drawer has been serviced and realigned.

### 5.5.1 Initial Checks / Set-up

Any Data Management System software version less than version 17 will not include the repeatability test. Discard any individual REPEAT diskette manufactured prior to the release of DMS version 17. Use only the REPEAT program that comes with DMS Version 17 or greater.

Prepare a water blank tray by inoculating a blank panel (3280-1160) with inoculum water with PLURONIC®\* using the RENOK®. The water blank tray needs to sit for a minimum of one hour (covered) prior to initiating the repeatability test. Failure to do so may result in poor repeatability due to the water's surface tension not reaching equilibrium.

Prior to running the REPEAT program, check the printer and instrument configuration in the DMS customization. Be certain that the proper port and console assignments have been made.

**NOTE:**

***A report printer must be attached to the printer port assigned to the console that you are working from. The printer does not have to be powered on. If a report printer is not attached to the assigned printer port, then the computer will lockup when attempting to print after completion of the repeatability test. The computer will need to be cycled off and on to unlock the system. If you are unable to print in DMS, then you will be unable to print in the REPEAT program also.***

### 5.5.2 Repeatability Menu Selection Overview

After REPEAT has successfully linked with an autoSCAN®-4, the screen will display the autoSCAN®-4 Repeatability Test Options Menu:

**autoSCAN-4 Repeatability Test Ver: 3.0.0**

**Options Menu**

- Run Repeatability Test
- Calibrate autoSCAN-4
- View DMS Port Assignments
- Edit Default Settings
- Exit Repeatability Program

Use the down arrow key to highlight the intended option, then <Enter> to begin.

**Run Repeatability Test**

This option will run the program of pulling in the drawer, reading the panel and returning the drawer to the open position for the number of times you have selected. It will also calculate the peak difference for each well over the course of selected readings. The panel being run should be the same panel that was previously calibrated.

\* PLURONIC® Surfactants is a registered trademark of BASF Corporation, Parsippany, NJ USA



**Calibrate autoSCAN®-4**

This option will calibrate the autoSCAN®-4 instrument. When performing this option remember to insert a "Water Blank Panel" prior to pressing the Read button. Prior to running the "Repeatability" test this calibration must be performed.

**View DMS Port Assignments**

The information on this menu is obtained from the DMS customization and cannot be altered when in this menu. If there are two autoSCAN®-4s, then you can select which of the two autoSCAN®-4 that you want to test. If an autoSCAN®-4 is having a problem connected to a particular comm port, you can switch the autoSCAN®-4 cable from its comm port to another comm port and select the new comm port from the "View DMS Port Assignments" menu. This newly selected comm port does not need to be reconfigured as an autoSCAN®-4 in the DMS customization. Using the example below, the autoSCAN®-4 can be connected to comm 3 which is presently configured for a touchSCAN®-SR. The repeatability test will run normally as though comm 3 was assigned an autoSCAN®-4 in the DMS customization.

**DMS Port Assignments**

Comm 1/autoSCAN-4  
Comm 2/autoSCAN-4  
Comm 3/touchSCAN-SR

↓↑ = Scroll    Enter = Select    Esc = Exit

**Editing Default Settings**

This menu allows you to edit the default settings of the repeatability test. Selecting this option will display the following menu.

**-CHANGE DEFAULT PARAMETERS-**

Number of Repeats: 5      Number of Initial reads: 0  
Time Between Repeats: 0    Displayed Filter: 7  
Wait for AS-4 read button: N

Maximum Read Differences:	Filter #1 =	20	PRINTED
	Filter #2 =	20	PRINTED
	Filter #3 =	20	PRINTED
	Filter #4 =	20	PRINTED
	Filter #5 =	40	PRINTED
	Filter #6 =	20	PRINTED
	Filter #7 =	40	PRINTED

Enter the number of repeats: 5

**Definitions of the Default Settings:****Number of Repeats**

This is the number of times (or cycles) that you want a panel to be read during the repeatability test. Possible entries are between 0 and 99.



**Time Between Repeats**

This is the amount of time (in seconds) that REPEAT will pause between panel readings during the repeatability test. This should normally be set to zero. Possible entries are between 0 and 99.

**Number of Initial Reads**

This is the number of times that REPEAT will read a panel initially before it starts the repeatability test. The panel data read by the autoSCAN®-4 during these initial readings is not part of the repeatability data. Possible entries are between 0 and 99.

**Displayed Filter**

This is the filter data displayed on the screen during the repeatability test. The data for the other filters may only be examined after the repeatability test is complete.

**Wait for AS-4 Read Button**

If this field is set to **Y**, then REPEAT will wait for you to press the autoSCAN®-4's READ button prior to each reading during the repeatability test. If it is set to **N**, then it will not wait.

**Maximum Read Differences**

Maximum limit value for the read differences. If the read difference on a particular well and filter is greater than the maximum set limit, then that well will be underlined on the printout.

As you edit the default settings, REPEAT will prompt you for new default values for each field. If you press <Enter> without entering a new default value, the old default value will remain unchanged. After changes are made to the settings, REPEAT will ask you if you want to save the new default values to the hard disk; if you answer N, the changes that you just made will only remain in effect during the session.

**Exit Repeatability Program**

After selecting this option, the screen will display:

**Remove the water blank tray from the as-4 drawer**

Pressing <Enter> will take you back to the system prompt while pressing the <Esc> key and <Enter> key and will jump you back to the autoSCAN®-4 Repeatability Test Options Menu.

**5.5.3 Procedure**

1. Exit all consoles by selecting option 10 from the Main Menu to perform a system exit. At the system prompt (D> or C>DMS) type **REPEAT** <Enter> to initiate the repeatability program.

Upon initialization REPEAT looks to see if the DMS has any autoSCAN®-4s installed. If REPEAT finds only one autoSCAN®-4, then it will try to link to it. If REPEAT finds more than one autoSCAN®-4, then it will display a list of DMS port assignments. Select the comm port in which the autoSCAN®-4 of interest is connected. If REPEAT does not find any autoSCAN®-4s to link to because the DMS has not been configured, then it will display an error

message "Program Aborted. Invalid I/O Port Address." and will exit back to the system prompt. If REPEAT is unable to link to a DMS configured autoSCAN®-4 (it will try for about 5 seconds), then the screen will display the autoSCAN®-4 Repeatability Test Options Menu. Refer to Section 5.5.5 for troubleshooting information.

- Place the Water Blank tray onto the autoSCAN®-4 drawer. Select "Calibrate autoSCAN®-4" from the option menu and press <Enter>. The drawer will pull the water blank panel into the reader and the following screen will display:

**Calibration In Progress**  
**Press Esc to stop operation**

This calibration will take 40 seconds and the drawer will open. The monitor will return to the main option menu.

- Select "Run Repeatability Test" and <Enter>.

**NOTE:**

*The panel being run should be the same panel previously calibrated. If the panel was changed or rotated for any reason you should recalibrate prior to running that panel.*

The following message will appear:

**Do you want to print raw well values (Y/N)?**

After selecting "Y" or "N" the screen will prompt you to type in a report name:

**Do you want to print raw well values (Y/N)? N**  
**Name of Report: Test**  
**Press Enter to begin the test:**

Enter a report name and press <Enter>. Press <Enter> again to begin the test. The autoSCAN®-4 will draw in the water blank tray and read at all seven filter stages: 620nm, 560nm, 505nm, 470nm, 440nm, 590nm, and 590nm with aperture plate in place. After 5 seconds of reading, the drawer will push out. If the number of repeats is set to 5 (under the "Edit Default Settings" menu), then the autoSCAN®-4 will repeat four more cycles of pulling in the drawer, reading the water blank and pushing out the drawer. During the test, the screen will display some numbers such as the example shown below:

**Test in progress**  
**Press Escape to abort the test**

**Differences for filter 7**

2	2	2	5	8	6	4	4	3	5	8	6
3	1	2	4	9	6	2	3	3	4	4	1
10	1	3	2	4	2	2	2	5	5	3	3
1	12	11	9	2	2	7	2	3	4	2	2
2	2	2	8	15	11	2	2	4	4	2	1
4	4	4	8	9	3	2	3	10	3	5	4
5	6	3	2	1	3	9	5	10	8	8	2
3	6	2	2	1	3	11	12	15	4	5	2

4. After the repeatability test is complete you can view data from another filter (other than what is presently displayed on the screen) by selecting the filter number of choice and <Enter>. This option is not available when the repeatability test is still in progress. A report will printout after the repeatability test has been completed.

### **5.5.4 Error Messages**

#### **Program Aborted. Invalid I/O Port Address**

The DMS has not been configured. You may correct this in the hardware configuration section of the DMS Customization Menu.

#### **SGInit Failure**

If the DMS is running okay, then probably files REPEAT.SM0 and REPEAT.SH0 need to be reloaded. If the DMS is having problems, then SGCONFIG.TBL may need to be reloaded.

### **5.5.5 Troubleshooting**

#### **Unable to link to AS-4**

1. When the computer and the autoSCAN®-4 have just been turned on, sometimes REPEAT will not link to an autoSCAN®-4 the first time it tries. Ignore the message and proceed to calibrate or select the DMS comm port associated with the autoSCAN®-4.
2. Confirm that an autoSCAN®-4 is indeed attached to the comm port that the DMS says it should be connected to.
3. Try attaching the autoSCAN®-4 to a different comm port and select that comm port through the "View DMS Port Assignments" menu.

#### **Computer halts during repeatability test**

Check the DMS customization for whether or not the correct type of printer is attached to the correct printer port assigned to the console you are working from.

#### **REPEAT will not print reports**

Try printing any report from the DMS. If the DMS can print reports from the console you are working on, REPEAT should be able to as well.

#### **Well values are extremely large**

This will occur when REPEAT is being run on a computer system that is not supported by MicroScan and is running Concurrent DOS Version 3.2. There is a timing problem between the computer and the autoSCAN®-4.

#### **Causes for high numbers on the first 6 filters**

1. Inconsistent or improper drawer movement and seating
2. Unstable lamp or electronics
3. Weak spring tension on aperture plate
4. Dust and contamination on the color wheel interference filters
5. Contamination in particular wells. Rotate the water blank tray, rerun REPEAT and see if the problem has moved or is at the same location.

**Causes for inconsistent aperture plate movement (high numbers on filter 7)**

1. Warped or distorted aperture plate
2. Contamination between the aperture plate and fiber bundle block
3. One of the diffuser clips coming in contact with the aperture plate
4. Weak aperture plate spring, causing the aperture plate not to return completely
5. Burrs on the aperture plate, particularly at the slotted holes that slide on the shoulder screws
6. Improperly adjusted or contaminated shoulder screws (clearance approximately 0.010")
7. Improperly mounted or adjusted solenoid mounting bracket
8. Contamination in the solenoid assembly, or rough edges on the solenoid plunger
9. The drawer assembly rubbing against the aperture plate
10. Unmodified (uncut) aperture plate plunger
11. Aperture plate plunger slot (where aperture plate slides into plunger) too narrow, or has sharp edges.

## **5.6 Water Blank Calibration**

### **Water program-Overview**

The Water program is intended to improve the accuracy of the autoSCAN®-4 trayreader by including into the MIC algorithm a table of 96 values representing the difference between the trayreader's air reading (autoSCAN®-4 air calibration) and the trayreader's average sterile water panel reading. Trayread software can then reduce optical effects of reading water (when compared to the instrument's air calibration) for any of the 96 possible MIC well positions on MicroScan® panels.

The autoSCAN®-4 trayreader should have all elements of Preventative Maintenance (instrument cleaning, mechanical drawer alignment, power supply and electrical calibration adjustments) performed prior to operating the **Water** program. The MicroScan® Data Management System (DMS) must be properly customized for the trayreader configuration that will be used. Be sure to verify the trayreader configuration within the DMS Customization before proceeding. If more than one autoSCAN®-4 trayreader will be operated, ensure that the console that operates a particular autoSCAN®-4 trayreader does indeed operate that trayreader.

A Water Blank file is a unique water calibration file for a specific autoSCAN®-4 trayreader. The Water Blank file created for one specific autoSCAN®-4 trayreader should never be copied or transferred to another system and used as the water calibration file for a different autoSCAN®-4 trayreader.

The **Water** program **Creates, Displays, Prints, or Copies** "Water Blank" (Water Calibration) files. This program will support multiple trayreader configurations by creating multiple Water Blank files, one for each autoSCAN®-4 trayreader. The **Water** program must be run from the console that would ordinarily operate the trayreader.

**NOTE:**

***If two autoSCAN®-4 trayreaders are to be operated from the same computer, the Water program will have to be run twice; once from***



*the console that operates one trayreader, and again from the console that operates the other trayreader.*

*For example, an autoSCAN®-4 #1 is configured for serial port #1 and is operated from Console #1, while autoSCAN®-4 #2 is configured for serial port #2 and operated by Console #2. If you operate the Water program from Console #1, it will link to the autoSCAN®-4 trayreader connected to serial port #1. If you operate the Water program from Console #2, it will link to the trayreader connected to serial port #2.*

The Water Blank (water calibration) file **must** be recreated by either the operator or a qualified Field Service Representative if any component or assembly in the optical light path is replaced or realigned. These components and assemblies include the photo board, aperture plate, glass diffuser plate, light fiber(s), collimation lenses, 590nm interference filter, or the tungsten halogen lamp. If the autoSCAN®-4 drawer assembly is subsequently realigned the Water Blank file will have to be recreated.

The "Read Panels" option of autoSCAN®-4 trayread software will not function if the Water Blank file is not present on the computer's hard disk drive. The trayreader will perform daily QC diagnostics and instrument (air) calibration without the presence of the Water Blank file on the computer's hard disk.

### **5.6.1 New autoSCAN®-4 Trayreader Installations**

New autoSCAN®-4 trayreaders have Water Blank file diskettes (both 3 1/2" and 5 1/4" versions) supplied with the trayreader. For these new installations, it is NOT necessary to create the Water Blank file, since the file was created at MicroScan prior to the release and shipment of the instrument.

Please proceed to Section 5.6.3 "Installing (Copying) the Water Blank File on a New autoSCAN®-4 Trayreader System" if you are installing an additional autoSCAN®-4 trayreader on an existing system.

**NOTE:**

***With multiple autoSCAN®-4 trayreader systems, it is very important that the cable connections between each autoSCAN®-4 trayreader and the computer's serial ports are labeled clearly with the autoSCAN®-4's serial number. These cable connections should not be subsequently moved after creation or copying the Water Blank file, unless the instrument configuration within customization is modified, and the Water Blank file on the backup floppy diskette is restored using the "Copy" function of the Water program. If the serial port cable connections for the autoSCAN®-4 trayreader must be moved, please proceed to the section of this manual for information regarding "Switching autoSCAN®-4 serial port connections." Follow all installation instructions carefully to ensure that the appropriate Water Blank (water calibration) file is applied to the appropriate autoSCAN®-4.***

### 5.6.2 Creating A Water Blank File

1. Prepare ten water trays using the following supplies:

RENOK®	B1018-14
Ten bottles inoculum water with PLURONIC	B1015-7 (60 ct.) OR,
(Ten bottles Prompt Inoculation System-D)	B1026-10D (60 ct.)
Ten Dry Panel inoculators	B1013-4 (240 ct.)
*Twelve autoSCAN®-4 Water Blank Panels	3280-1160

**NOTE:**

*The autoSCAN®-4 Water Blank Panel kit, P/N 3280-1160, consists of 12 various panel plastic mold types. Also included with the autoSCAN®-4 Water Blank panel kit is an abbreviated autoSCAN®-4 water calibration program instruction sheet.*

*Prior to preparing the Water Blank panels, inspect each empty tray and remove any contamination (dust, debris) that may be present in the panel wells. The two extra panels provided can be used as a top and bottom cover tray. After preparing the panels with Prompt or inoculum water with PLURONIC, the water panels can be used for a period of up to 18 hours.*

2. Stack and cover the trays, using the extra cover and bottom tray. Allow the panels to equilibrate for a minimum of one hour before using.
3. Exit the DMS menu. At the system prompt, type **WATER** then press <Enter>.
4. The following menu will be displayed:
  1. Create a New Water Blank Average File
  2. Display the Water Blank Average File
  3. Print the Water Blank Average File
  4. Copy a Water Blank file.

5. Select "Create a New Water Blank Average File." A warning will display indicating that this program should not be run unless the drawer has been mechanically aligned.

The autoSCAN®-4 trayreader should have all elements of preventative maintenance performed (thoroughly cleaned, mechanically aligned, and electrically adjusted) prior to operation of the Water program.

6. Press the <Enter> key.

After pressing the <Enter> key, the trayreader will require an air calibration to be performed. Be sure that the autoSCAN®-4 trayreader drawer is empty.

7. Press the READ button on the autoSCAN®-4 trayreader. When the air calibration is completed, the program will prompt the operator for the number of water trays to be run, with the default and recommended number being 10 water trays.
8. Press <Enter> to continue with reading 10 water trays.

The program then prompts for the first of ten water trays. The water trays should have equilibrated for at least one hour. Make sure to wipe the condensation from the bottom of each tray with a lint free cloth as the program prompts for each of the ten water trays.

An individual Water Blank panel's air / water difference will be displayed if one or more of the panel's well readings is over the "acceptable tolerance" of 200 units. If the air / water difference exceeds this tolerance, the program will inform the operator of this error condition, the number of wells over the "acceptable tolerance," and shows the well's value and position on the display.

If this error condition occurs, inspect the indicated well position(s) of the panel being read for any contamination (dust, debris). If visible contamination exists in the panel well(s), discard the panel and proceed as described below.

Press the <Enter> key to observe the available options:

- |    |                   |  |
|----|-------------------|--|
| 1) | Process the panel | <b>(not recommended)</b>                         |
| 2) | Reread the panel  | (if not contaminated, rotate 180° for rereading) |
| 3) | Abort the panel   | (if panel is contaminated)                       |

Option "3" will reduce the total number of panels used to create the average sterile panel reading. A minimum number of 8 panels readings must occur to create this panel average.

If an error occurs indicating that a water tray contains well values over the "acceptable tolerance", try to re-read the water tray by rotating it 180°. If an error occurs with this same tray re-read in this way, abort this water tray's reading (through option "3") and continue with the next water tray. It is very likely that the aborted water tray is damaged, optically distorted, or has contamination in the well(s).

If necessary to obtain the minimum 8 water tray average, re-read water trays that previously had "acceptable tolerances" by rotating them 180°.

**NOTE:**

***Do not read any individual tray in the same direction more than once to obtain the minimum 8 water tray average required by the program. If it is impossible to obtain the minimum 8 water tray average reading required, and the water trays used have not been found to be contaminated or defective, repairs or adjustments must be performed to the autoSCAN®-4 trayreader. Thorough cleaning, mechanical drawer alignment, power supply and electrical calibration adjustments, or the replacement of mechanical assemblies or optical components may be required. A Total System Checkout should be performed after any replacements or adjustments.***

9. When completing the creation of a Water Blank file, the program will prompt the operator for the trayreader's serial number. Enter the serial number and press the <Enter> key.
10. The program will then prompt the operator to save the file on a floppy diskette (A:) or on the hard disk drive (C: or D:). Select the hard disk drive, but



subsequently make a backup copy of the Water Blank file on a floppy diskette.

**(Refer to Section 5.6.4, "Creating a Backup Copy of the Water Blank File")**

11. After the creation of the Water Blank file, it is possible for the operator to display or print the Water Blank file from either the hard disk drive or floppy diskette. When displayed or printed, the autoSCAN®-4 trayreader serial number will be displayed or printed with the date and time the Water Blank file was created.
12. Exit the Water program and reboot the computer by simultaneously pressing <CNTRL>-<ALT>-<DEL> in order to re-enter the Data Management System. The autoSCAN®-4 Water Blank MIC algorithm will now be used during trayread functions.

### ***5.6.3 Installing (Copying) the Water Blank File on a New autoSCAN®-4***

When the **Water** program's "Copy" function is used, the program will examine the trayreader configuration file in Customization to determine which serial port the autoSCAN®-4 trayreader is connected.

The Water Blank file backup diskette for each instrument should be retained with the trayreader and maintained with all other dataset and customization backup diskettes. Mark the backup diskette(s) with each autoSCAN®-4 trayreader's serial number.

1. Ensure the Data Management System (DMS) is properly customized for the trayreader configuration that will be used before proceeding. If more than one autoSCAN®-4 trayreader will be operated, ensure that the console that operates a particular autoSCAN®-4 trayreader does indeed operate that trayreader.
2. Exit the DMS to the system prompt. At the system prompt, type **WATER** and press <Enter>.
3. A menu will display, allowing the operator to **Create, Display, Print** or **Copy a Water Blank file**.
4. Select option #4, "**Copy a Water Blank file**."
5. The program will prompt you to "**Enter source disk ...**". Type "**A**" and press <Enter>.
6. The program will ask: "**Copy file from drive A to drive C (or D) (Y/N)?**" Type "**Y**" and press <Enter>.
7. Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen.
8. Exit the **Water** program and reboot the computer by simultaneously pressing <CNTRL>-<ALT>-<DEL> in order to re-enter the Data Management System.



The autoSCAN®-4 Water Blank MIC algorithm will now be used during trayread functions.

**NOTE:**

*If two autoSCAN®-4 trayreaders are connected, and are to be operated from the same computer, the Water program (and the "Copy" option) will have to be run twice; once from the console that operates one trayreader, and again from the console that operates the other trayreader. Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen when the Water program is run from each of the appropriate consoles.*

#### **5.6.4 Creating a Backup Copy of the Water Blank File**

Whenever a Water Blank file has been created, a backup copy of this file must be made on a floppy disk. The following steps will allow the operator to make this backup copy.

1. Ensure the Data Management System (DMS) is properly customized for the autoSCAN®-4 trayreader before proceeding. If more than one autoSCAN®-4 trayreader will be operated, ensure that the console that operates a particular autoSCAN®-4 trayreader does indeed operate that trayreader.

2. Exit the DMS to the system prompt. At the system prompt, type **WATER** and press <Enter>.

A menu will display, allowing the operator to **Create, Display, Print or Copy a Water Blank file**.

3. Select option #4, "**Copy a Water Blank file**".
4. The program will prompt you to "**Enter source disk ...**". Type "**C (or D)**" and press <Enter>.
5. The program will ask: "**Copy file from drive C (or D) to drive A (Y/N)?**". Type "**Y**" and press <Enter>. Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen.
6. Exit the **Water** program and reboot the computer by simultaneously pressing <CNTRL>-<ALT>-<DEL> in order to re-enter the Data Management System.

**NOTE:**

*If two autoSCAN®-4 trayreaders are connected, and are to be operated from the same computer, the Water program (and the "Copy" option) will have to be run twice; once from the console that operates one trayreader, and again from the console that operates the other trayreader.*

*Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen when the Water program is run from each of the appropriate consoles. The Water Blank file backup diskette for each instrument should be retained with the trayreader and maintained with all other dataset and customization backup diskettes. Mark the backup diskette(s) with each trayreader's serial number.*

### **5.6.5 Switching autoSCAN®-4 Serial Port Connections**

Switching the autoSCAN®-4 trayreader serial port connection of the computer from one location to another will require the conversion of the Water Blank file for the serial port the instrument is to be connected.

1. Ensure a backup floppy diskette of the Water Blank file has been created.
2. The MicroScan Data Management System (DMS) customization (instrument configuration) must be modified to accommodate the new serial port connections for the trayreader configuration that will be used. Be sure to verify the trayreader configuration within the DMS Customization before proceeding.
3. Exit the DMS to the system prompt. At the system prompt, type **WATER** and press <Enter>.
4. Select option #4, "**Copy a Water Blank file**".
5. The program will prompt you to "**Enter source disk ...**". Type "**A**" and press <Enter>.
6. Type "**Y**" and press <Enter>.
7. Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen.
8. Exit the **Water** program and reboot the computer by simultaneously pressing <CNTRL>-<ALT>-<DEL> in order to re-enter the Data Management System.

**NOTE:**

*If two autoSCAN®-4 trayreaders are connected, and are to be operated from the same computer, the Water program (and the "Copy" option) will have to be run twice; once from the console that operates one trayreader, and again from the console that operates the other trayreader.*

*Verify the correct autoSCAN®-4 serial number appears at the bottom of the screen when the Water program is run from each of the appropriate consoles. The Water Blank file backup diskette for each instrument should be retained with the trayreader and maintained with all other dataset and customization backup diskettes. Mark the backup diskette(s) with each trayreader's serial number.*

### **5.6.6 Water Blank Algorithm**

The Water Blank table of 96 values is created by subtracting the average value of the eight to ten water tray readings (590nm w/ aperture - 7th filter) from the air calibration (590nm w/ aperture - 7th filter) of the autoSCAN®-4 trayreader. A negative number for any particular well position in the Water Blank table indicates that same position's photodiode receives more light through water than it receives during the air calibration. A positive number for any particular well

position in the Water Blank table indicates that same position's photodiode receives less light through water than it receives during the air calibration.

The Water Blank values are calculated using the following formula:

$$\text{Air Calibration (590nm w / aperture)} - \text{Average value (of 8 to 10) sterile water readings (590nm w/ aperture)}$$

MIC processed data will now have the Water Blank table included in it's algorithm:

$$\text{Air Calibration (590nm w/ aperture)} - \text{Water Blank} - \text{Raw Panel Read (590nm w/ aperture)}$$

This algorithm compensates for the optical effect of fluid and tray cavity on MicroScan panels, producing improved MIC readings for each individual autoSCAN®-4 trayreader.

The autoSCAN®-4 trayreader should have all elements of preventative maintenance performed (thoroughly cleaned, mechanically aligned, and electrically adjusted) prior to operation of the Water program.

With multiple autoSCAN®-4 trayreader systems, it is very important that the cable connections between each autoSCAN®-4 trayreader and the computer's serial ports are labeled clearly with the autoSCAN®-4's serial number. These cable connections should not be subsequently moved after creation or copying the Water Blank file, unless the instrument configuration within customization is modified, and the Water Blank file on the backup floppy diskette is restored using the "Copy" function of the Water program. If the serial port cable connections for the autoSCAN®-4 trayreader must be moved, please proceed to Section 5.6.5, "Switching autoSCAN®-4 Serial Port Connections."





# Section 6

## Preventative Maintenance

### 6.1 Introduction

To ensure the continued trouble free operation of the autoSCAN®-4 and its associated components, a program of comprehensive scheduled preventative maintenance is required. This involves complete inspection, the periodic replacement of specific components, cleaning parts and assemblies, and complete electrical and mechanical adjustments.

The customer is responsible for daily checks and cleaning of specific components. The FSR is responsible for performing preventative maintenance annually, unless problems exist which require special attention.

**NOTE:**

*The autoSCAN®-4 requires no lubrication.*

### 6.2 Materials/Equipment Required

Part Number	Description
7450-0001	Tungsten Halogen Lamp, 13V, 85W
5536-1001	Photodiode Plastic Shield
5639-0001	Glass Diffuser Plate
5634-0006	Left Diffuser Retainer Clip
5634-0007	Right Diffuser Retainer Clip
9022-0001	Fan Filter Element (power supply fan)
6500-0173	Light Shield, Left
6500-0171	Front Drawer Shield
9800-0767	Box of System Checkout Panels (72 empty panels/box)
5536-0002	Offset Test Panel
5632-0002	Timing Belt, 135 Grooved (old style drawer)
5601-0283	Timing Belt, 175 Tooth (mounted diagonally in new style drawer)
5601-0197	Belt Toothed, 285 Grooved (mounted horizontally in the new style drawer)
B1015-7	Inoculum Water with PLURONIC
B1018-14	RENOK®
	Drawer Alignment Jig
	Source of Compressed Air
	Isopropyl Alcohol or S/P Lens Cleaner
	Lens Paper

### 6.3 Inspect and Clean the Following Parts or Assemblies

1. The color wheel housing interior should be made free of all dust and dirt by using compressed air or by wiping with a clean lint-free cloth.

2. The tungsten halogen lamp should be changed annually. If the lamp has recently been changed, then verify that it is clean and free of dust, dirt and any optical imperfections. The lamp should be fully seated in the lamp bracket with no obstruction (wires) in front of the lamp.
3. The hot mirror and aspheric lenses should be cleaned.
4. The filters should be clean and scratch free. They should be checked for delamination and replaced as necessary. They may be checked by advancing the color wheel with the front of the color wheel housing removed and the light shining through the filters. The light beam should be centered within each filter. If it is not, then adjust by moving the color wheel opto slightly to the left or right and checking by advancing the color wheel. Clean all optical components using alcohol or S/P Lens Cleaner and lens paper. Be careful not to scratch the delicate surfaces.
5. Both the power supply cooling fan and color wheel assembly cooling fan should be inspected for proper operation and cleaned as necessary. The power supply cooling fan filter element should be cleaned in a mild soapy solution.
6. The wells of the fiber bundle block should be free of any dirt or contamination. Use compressed air to blow out any debris that may block the light path. Be sure all fibers (including the 2 reference fibers) are intact and are fully inserted in the fiber bundle block.
7. The glass diffuser plate should be cleaned with alcohol and a lint free cloth. If there is a question of its optical uniform clarity, it should be replaced.
8. The photodiode plastic shield should be inspected and cleaned. If it is scratched, it should be replaced. If replacement is necessary, be sure to cut a small notch at the upper right corner to aid in orientation.

## ***6.4 Mechanically Adjust the Following Parts or Assemblies***

1. The color wheel opto-interrupter is properly adjusted by accessing the FSR Diagnostics and advancing the color wheel to each color position, ensuring the color wheel can find the home position from each color. Adjust the opto as necessary.

The color wheel home opto-interrupter analog output voltage is measured between TP1 and pin 2 of J3 (top middle white wire) on the power board. The voltage at all filter positions, excluding the home position, should be approximately zero. The home position should read approximately 4.5 Volts. Adjust the opto by moving it inward or outward from the edge of the color wheel. The color wheel "on color" opto-interrupter analog output voltage is measured between TP1 and pin 7 of J3 on the power board. The voltage at all filter positions, including the home position, should be approximately 4.5 Volts.

2. The drawer opto-interrupters are properly adjusted to provide spring tension on the drawer gear rack (when the drawer is closed) and to prevent the drawer from hitting the front drawer shield (when the drawer is open). Verify by accessing the FSR Diagnostics Drawer Motion Test.

- a. During the Opto-Interrupter Test, one opto should read clear while the other should read blocked. With the drawer open, wiggle the front of the drawer and verify that the opto readings do not change. If the drawer open opto changes from "blocked" to "clear" after the front of the drawer is wiggled, then this can cause intermittent link problems and drawer motion failures. Note the width of the front drawer flag, whether its an old or new style drawer assembly and what size capacitor is located at C29 on the Power Board Assembly:

.28" flag (Old Style Drawer)	0.01 ufd capacitor at C29	needs to have a 0.33ufd capacitor on the drawer open opto circuit board (old style drawers). This modification will delay the drawer open signal by increasing the circuit's RC time constant so that the drawer open flag will be positioned in the middle of the opto and thereby eliminating signal loss due to drawer movement.
.28" flag (Old Style Drawer)	0.33 ufd capacitor at C29	no capacitor should be on the drawer open opto circuit board.
.25" flag (New Style Drawer)	0.1 ufd capacitor at C29	Call MicroScan Field Support if you are experiencing a problem.

The original Power Board Assembly had a 0.01 ufd capacitor which later was changed to 0.33 ufd. When the new style drawer was introduced, the 0.33 ufd capacitor on the Power Board Assembly was changed to 0.1 ufd.

- b. Verify that there is proper spring tension on the drawer gear rack (old drawer assembly) or the plate tensioner (new drawer assembly). This is done by looking at the drawer gear rack or plate tensioner when the unit is powered on in the closed position. When the power is turned off, you should see the drawer gear rack or plate tensioner move due to the release of spring tension. If you do not see any movement, then adjust the rear opto further back until proper spring tension is accomplished.
3. Inspect the left light shield and front drawer shield to ensure that they are in position and secured properly. Replace if necessary. Use Super-Glue to adhere the new shields to the inside of the unit.
  4. Inspect the drawer belt(s) for wear and proper tension. Replace and/or adjust as necessary.
  5. Verify drawer alignment. Refer to Section 5.3. When the drawer closes, the front of the drawer should not shift as it seats against the two front tooling balls. Also, ensure that the front tooling balls (located on the fiber bundle block) seat in the center of the indents (located on the drawer front support block) when the drawer is closed. This can be checked by wiggling the drawer front support block from side to side and there should not be any movement (performed with the drawer closed).
  6. Manually push the aperture plate in. Verify that there is full movement and no hesitation in movement. If there is, then the aperture plate may need to be removed and cleaned or the 4 shoulder screws do not have the necessary



0.010 to 0.012" clearance above the aperture plate. Use care in removing the shoulder screws. If permanent (red) Loctite was used, then the screw will break inside the fiber bundle block and a new block would need to be ordered. Use only (blue) Loctite 242 and wipe up any excess Loctite that may cause the aperture plate to stick when dried.

7. Check for aperture plate solenoid operation by accessing the FSR Diagnostics Light Source Test.

## ***6.5 Electronically Adjust the Following Parts or Assemblies***

1. Adjust the 12 volt main power supply for  $12.3 \pm 0.05$  volts as measured at the Power Board (use TP1 and TP4).
2. Access the FSR Diagnostics and run the CPU Board Test.
3. Access the FSR Diagnostics Power Supply Voltage Tests and adjust at the Power Board if necessary:  
  
+5  $\pm 0.1$  volts as viewed on the screen  
+15  $\pm 0.1$  volts as viewed on the screen  
-15  $\pm 0.1$  volts as viewed on the screen
4. Access the FSR Diagnostics A/D and Photoboard Tests and adjust the Reference Fiber Voltage for a range of 1.09 and 1.11 volts as measured on the filter with the greatest reference voltage output (typically filter 1 or filter 2). Adjust R3 on the photoboard as necessary.
5. Access the FSR Diagnostics and perform the calibration and alignment of the A/D and Photoboard. When making adjustments on the A/D board, locate the three pots near the front of the board. R3 is the pot on the left, R36 is the pot in the center and R4 is the pot on the right. Remember to subtract 223 units from the value etched upon an old style offset test panel (identified by no date etched in the corner of the panel). Target value is the number etched in the corner (i.e. do not subtract 223) on new style offset test panel (identified by having a date etched in corner). This number should be within 20 units of the Panel Characteristic Number (Final Offset Adjustment Menu).
6. Return to the autoSCAN®-4 Tray Reader Menu and select Option 2, Perform Daily QC Diagnostics, and obtain a printout.
7. From the same Tray Reader Menu select Option 3, Perform Instrument Calibration, and obtain a printout. Verify that the DAC values are <235.

## ***6.6 Final Testing***

1. Perform the Repeatability Test with a water blank (equilibrated for one hour).
2. Create a new Water Blank file if any component or assembly in the optical light path is replaced or realigned.



3. To ensure proper instrument operation, have the customer run actual QC organisms and verify autoSCAN®-4 readings against manual readings.

## **6.7 autoSCAN®-4 Total System Checklist**

1. Inspect and clean entire instrument
  - a. All optical components. Be sure all fibers are intact and fully inserted in the fiber bundle block.
  - b. Power supply cooling fan and color wheel cooling fan
2.  $12.3 \pm 0.05$  Volts measured at the power board TP1 and TP4
3. Verify drawer alignment
4. Aperture plate spring tension - full movement and no hesitation in movement
5. CPU Board Test
  - a. Prom Checksum
  - b. RAM Memory Test
6. Power Supply Voltage Tests
  - a. +5 0.1 Volts as viewed on the screen. Adjust R22 on the power board.
  - b. -15 0.1 Volts as viewed on the screen. Adjust R21 on the power board.
  - c. +15 0.1 Volts as viewed on the screen. Adjust R20 on the power board.
7. Drawer Motion Test
  - a. Close Drawer - check drawer spring tension
  - b. Open Drawer - drawer should not hit the light gasket at the drawer opening
  - c. Opto-Interrupter Test (one opto should read open while the other should read closed)
  - d. Drawer Pulley Belt Tension
8. Color Wheel Test
  - a. Advance Color Wheel and Home Color Wheel
    - i. Advance to each color and then home from each color  
The color wheel home opto-interrupter analog output voltage is measured between TP1 and pin 2 of J3 (top middle white wire) on the power board. The voltage at all filter positions, excluding the home position, should be approximately zero. The home position should read approximately 4.5 Volts. Adjust the opto by moving it inward or outward from the edge of the color wheel.  
The color wheel "on color" opto-interrupter analog output voltage is measured between TP1 and pin 7 of J3 on the power board. The voltage at all filter positions, including the home position, should be approximately 4.5 Volts.
    - ii. No scratches or dirt on filters. Filters should not be delaminated.
    - iii. Light beam is centered within each filter. Adjust the opto by moving it slightly to the left or right.
    - iv. Mirror and lenses should be clean
  - b. Light Source Test
    - i. Lamp should be clean and fully seated in lamp bracket with no obstructions (wires) in front of the lamp.

- ii. Check for aperture plate solenoid operation
9. A/D and Photoboard Tests
- a. Reference Fiber Adjustment -  $1.1 \pm 0.01$  Volts measured on the filter with the greatest reference voltage output (typically Filter 1 - 620 nm or Filter 2 - 560 nm; should never be any other filter). Adjust R3 on the photo board.
  - b. Calibration and Alignment of A/D and Photo Board
    - i. Preliminary Gain Adjustment -  $10.0 \pm 0.01$  Volts measured at the A/D board TP11. Adjust R4 on the A/D board.
    - ii. Preliminary Offset Adjustment -  $0.00 \pm 0.002$  Volts measured at the A/D board TP11. Adjust R3 on the A/D board.
    - iii. Final Gain Adjustment -  $0.00 \pm 0.002$  Volts. Adjust R4 on the A/D board.
    - iv. Slope Set Adjustment - toggles between 9.995 and 10.000 Volts. Adjust R36 on the A/D board.
    - v. Slope Verify - -9.9 to -10.4 Volts
    - vi. Final Offset Adjustment - subtract 223 from value etched on old style offset test panel (identified by a lack of a date code in corner of panel) and this number is within 20 units of the Panel Characteristic Number. Adjust R3 on the A/D board.
10. Perform Instrument Calibration - verify that the DAC values are <235
11. Perform the Repeatability Test with a water blank (equilibrated for one hour)
12. Recreate Water Blank File if there were any changes to the optical light path/drawer alignment

# **Section 7**

## **Troubleshooting**

### **7.1 Reference Material**

The following information is provided as a reference section when dealing with various components in the autoSCAN®-4 system.

SCHEMATICS pertaining to the electronic assemblies of the autoSCAN®-4 may be found in Volume 2. Signal processing is illustrated in Figure 7-1.

MECHANICAL ASSEMBLY DRAWINGS are located in Volume 2.

RESISTOR COLOR CODE INFORMATION is listed in Table 7.1.

RECOMMENDED TROUBLESHOOTING EQUIPMENT is listed in Table 7.2.

### **7.2 Troubleshooting Techniques**

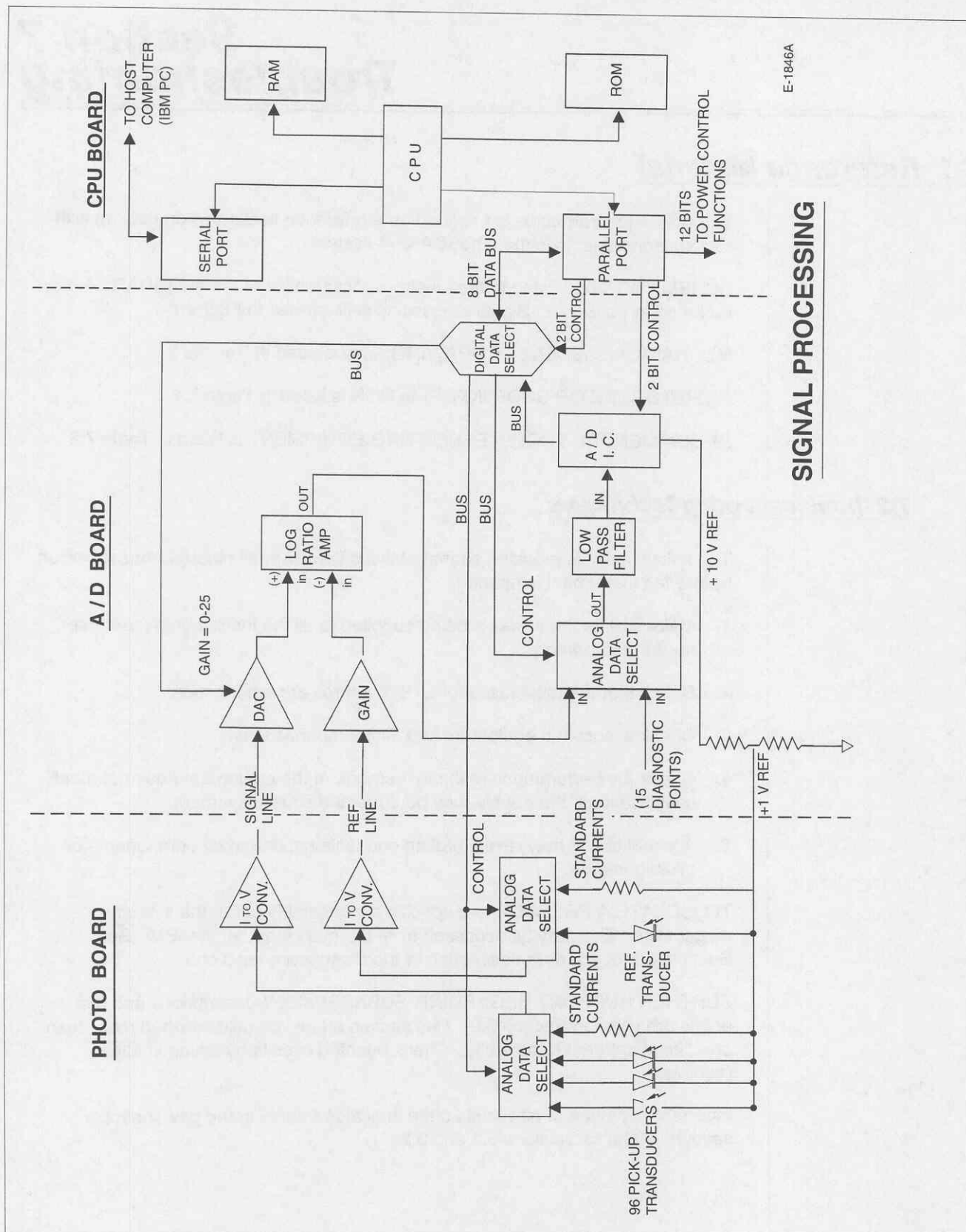
The following list is provided so that obvious items are eliminated from suspicion before the instrument is opened.

1. Make certain the power is being supplied to all the instruments (computer, reader and printer).
2. Check that the main fuses for all three items are still functional.
3. Check associated equipment and all interconnections.
4. Check the performance of the instrument. If the equipment does not meet specifications, the trouble may be corrected by readjustment.
5. A visual check may reveal broken connections, damaged components or misalignments.

TO ISOLATE A PROBLEM to a specific subassembly utilize the system diagnostics. This may be accessed from the main menu of the IBM. See Section 4.0 for a further description of the diagnostics functions.

FURTHER SUPPORT REGARDING SUBASSEMBLY descriptions and test points are given in Section 3.0. This section should be utilized when more than one circuit appears to be faulty. Check affected circuits by taking voltage readings.

Incorrect operation of all circuits often indicates trouble in the power supply section. Refer to Sections 3.1 and 3.2.



E-1846A

**SIGNAL PROCESSING**

Figure 7-1, Signal Processing



Table 7.1  
RESISTOR COLOR CODES

5% RESISTORS					1% RESISTORS				
COLOR	NO.					NO.			
	1	2	3	4		1	2	3	4 5
BLACK	0	0	0		0	0	0	0	
BROWN	1	1	10	1%	1	1	1	10	1%
RED	2	2	100	2%	2	2	2	100	
ORANGE	3	3	1K		3	3	3	1K	
YELLOW	4	4	10K		4	4	4	10K	
GREEN	5	5	100K		5	5	5	100K	.5%
BLUE	6	6	1M		6	6	6		.25%
VIOLET	7	7			7	7	7		.1%
GRAY	8	8			8	8	8		
WHITE	9	9			9	9	9		
GOLD				5%					

Table 7.2  
RECOMMENDED TEST EQUIPMENT

<u>Item</u>	<u>Dimensional or Performance Requirements</u>
Multimeter	Voltage range: 0 to 140 V Current range: 0 to 1.5A Resistance range: 0 to 10M ohm Sizes: .050 to 5/16 inch
Allen wrench set	
Non magnetic flat blade screwdriver	Blade width: 3/16 inch
Plastic adjustment screwdriver	Blade width: 1/16 inch
Open end wrench	Size: 3/16 inch
Crescent wrench	Max. size: 1/2 inch
Needle nose pliers	
Extraction tool	for removing Molex pins
Extraction tool	for removing Amp pins
Wire strippers	
Soldering iron	
Offset Test Panel	PN 5536-0002
Drawer Alignment Kit	PN 9800-1356
Water Blank Panels	PN 3280-1160



## Section 8 Replacement Parts List

PART NUMBER	DESCRIPTION
4220-0015	A/D BOARD
9800-1356	ALIGNMENT KIT, DRAWER, (1/FSR)
5531-0004	APERTURE PLATE
3101-3102	APERTURE SOLENOID AND PLUNGER
5632-0002	BELT, DRAWER (OLD DRAWER)
5632-1001	BELT, PULLEY, COLOR WHEEL
5601-0283	BELT, TIMING, 175 TOOTH (NEWER DRAWER, MOUNTED DIAGONALLY)
5601-0197	BELT, TIMING, 285 TOOTH (NEWER DRAWER, MOUNTED HORIZONTALLY)
5400-0947	BLOCK, IDLER, NEWER DRAWER (USE WITH 5400-0921)
5820-0001	BLOCK W/ ATTACHED FIBER BUNDLE
8100-2060	BOX TO SHIP AS4
9800-2399	CABLE, A/D-PHOTOBOARD
9800-1835	CABLE, COLOR WHEEL/POWER BOARD
9800-0960	CABLE, ENCLOSURE BOTTOM (AFTER S/N 6500)
9800-0195	CABLE, ENCLOSURE BOTTOM (BELOW S/N 6500)
9800-0519	CABLE, ENCLOSURE TOP
3003-1305	CABLE, INTERFACE, CPU-A/D, COLORED 50 PIN RIBBON (UNITS W/O CE MARK)
9800-2386	CABLE, INTERFACE, CPU-A/D, SHIELDED & GROUNDED (UNITS W/ CE MARK)
9800-0584	CABLE, LINK TO IBM, 15 FOOT (9 PIN)
9800-0954	CABLE, POWER SUPPLY
9800-0344	CABLE STAY (ATTACHES TOP AND BOTTOM ENCLOSURE)
5202-0003	CAM LOCK WITH KEY (BELOW S/N 6668)
5634-0006	CLIP, DIFFUSER RETAINER, LEFT
5634-0007	CLIP, DIFFUSER RETAINER , RIGHT
9800-0513	COLORWHEEL ASSEMBLY
5400-1713	COVER, BOTTOM
5400-2521	COVER, TOP (DADE GREEN)
4220-0098	CPU II PCB
9800-0740	DRAWER ASSEMBLY (NEW STYLE)
3015-2156	EDGE CONNECTOR, CPU (POWER)
4500-0103	FAN ASSEMBLY, COLOR WHEEL (12 Volt)
9800-1349	FAN COVER ASSEMBLY (POWER SUPPLY)
4200-0105	FAN, POWER SUPPLY COOLING, 115 VOLT (BELOW S/N 6500)
9800-0955	FAN, POWER SUPPLY COOLING, 12 VOLT (AFTER 6500)
5601-0759	FILTER, 440 N
5601-0760	FILTER, 470 NM
5601-0761	FILTER, 505 NM
5601-0762	FILTER, 560 NM
5601-0763	FILTER, 590 NM
5601-0764	FILTER, 620 NM

9022-0001	FILTER ELEMENT, COOLING FAN
5532-0018	FLAG, DRAWER OPEN
5400-0953	FRONT PULLEY ASSEMBLY, NEWER DRAWER
3106-1401	FUSE, 0.75 AMP (F1 & F2 - POWER BOARD)
3106-1211	FUSE, 2 AMP (MAIN)
3106-1402	FUSE, 2 AMP (F3 - POWER BOARD)
3106-1403	FUSE, 4 AMP (F5 - POWER BOARD)
3106-1404	FUSE, 3 AMP (F4 - POWER BOARD)
5631-0103	GEAR, PULLEY, 20 TOOTH, DRAWER MOTOR
5631-1002	GEAR, PULLEY, 30 TOOTH, COLOR WHEEL
5631-0102	GEAR, PULLEY, 48 TOOTH, DRAWER MOTOR (OLDER DRAWER)
5631-1001	GEAR, PULLEY, 90 TOOTH, COLOR WHEEL
5400-0921	IDLER, SLEEVED, NEWER DRAWER (USE WITH 5400-0947)
4500-0621	LAMP BRACKET ASSEMBLY
7450-0001	LAMP, TUNGSTEN HALOGEN
5400-2471	LATCH, STRIKER
5669-0000	LATCH, STRIKER, HOUSING
4220-0021	LED PCB (POWER INDICATOR)
8100-0517	LEFT FOAM CAP (USED FOR SHIPPING AS4)
4201-0202	MOTOR, STEPPER, COLOR WHEEL
4201-0203	MOTOR, STEPPER, DRAWER
5601-0811	O-RING (FILTERS)
3102-0201	OPTO-INTERRUPTER, COLOR WHEEL
9800-0411	OPTO-INTERRUPTER, DRAWER (OLD DRAWER ASSEMBLY)
9800-0743	OPTO/MOTOR ASSEMBLY, DRAWER (NEW DRAWER ASSEMBLY)
5536-0002	PANEL, OFFSET TEST (1/FSR)
3280-1160	PANELS, WATER BLANK (12/SET)
4220-0186	PHOTO BOARD II
5204-0099	PIN, SOLENOID PLUNGER, SMALL
5539-0003	PLATE, DRAWER FRONT
5639-0001	PLATE, GLASS DIFFUSER
9800-0259	POWER/CONTROLLER BOARD
3003-3005	POWER CORD, USA
9800-0956	POWER SUPPLY ASSEMBLY
5400-0954	REAR PULLEY ASSEMBLY, NEWER DRAWER
8100-0516	RIGHT FOAM CAP (USED FOR SHIPPING AS4)
5201-0101	RING CLIP (FILTERS)
5201-0103	RING CLIP (HOT MIRROR )
5203-0401	SCREW, APERTURE PLATE
9800-1965	SERVICE MANUAL ASSEMBLY, AS-4
6500-0171	SHIELD, DRAWER FRONT
6500-0173	SHIELD, LEFT SIDE SEAM
5536-1001	SHIELD, PHOTODIODE, PLASTIC
3004-1033	SOCKET, POWER, LINE FILTER
5634-0001	SPRING, APERTURE PLATE
3100-4204	SWITCH, INTERNAL, RESET/LOAD
3100-4205	SWITCH, PUSH BUTTON, READ
3100-6114	SWITCH, POWER INTERRUPT
4500-1022	SWITCH, PUSH BUTTON, POWER
3100-9217	SWITCH CAP, GREEN (READ)
3100-9218	SWITCH CAP, BLACK (POWER)



# DADE BEHRING

## Service Manual

### **autoSCAN®-4**

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Automated  
Microbiological  
Panel Reader

## Volume 2

9020-6469, Rev. A

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"Preparation of Manuals for Installation, Operation, and Repair of Laboratory Instruments."

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Dade Behring Inc.  
Dade MicroScan Inc.  
1584 Enterprise Blvd.  
West Sacramento, CA 95691 USA  
(916) 372-1900  
(800) 677-7226

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# ***Revision Record***

<b><i>Rev.</i></b>	<b><i>Date</i></b>	<b><i>Affected Pages</i></b>
A	May 1999	Initial Printing





# Contents

## Raw Materials Bills of Materials

9700-0259	Raw Materials Kit, Power Controller
9700-0701	Raw Materials Kit, autoSCAN®-4
9700-0740	Raw Materials Kit, autoSCAN®-4 Drawer
9700-0956	Raw Materials Kit, Power Supply Assembly

## Bills of Materials

9800-0132	Assembly BOM, autoSCAN®-4 Drawer (Old Style)
9800-0259	Assembly BOM, Power Controller
9800-0320	Assembly BOM, Cable, 9 Socket to 25 Pin, Serial
9800-0344	Assembly BOM, Cable Stay
9800-0513	Assembly BOM, Colorwheel
9800-0519	Assembly BOM, Cable, Power Harness Front Panel
9800-0701	Assembly BOM, autoSCAN®-4 Reader
9800-0737	Assembly BOM, Drawer Carrier
9800-0740	Assembly BOM, autoSCAN®-4 Drawer (New Style)
9800-0743	Assembly BOM, Opto Motor
9800-0954	Assembly BOM, Power Supply Cable
9800-0955	Assembly BOM, DC Fan
9800-0956	Assembly BOM, Power Supply
9800-0960	Assembly BOM, Cable, Enclosure Bottom
9800-1349	Assembly BOM, Fan Cover
9800-1835	Assembly BOM, Cable, Power Board/CW
9800-1837	Assembly BOM, Cable, A/D - Photoboard
9800-2386	Assembly BOM, Cable, A/D Interface
9800-2399	Assembly BOM, Cable, Photoboard
9800-2431	Assembly BOM, Bracket, CPU A/D

## Mechanical Assemblies

9900-0132	Assembly, autoSCAN®-4 Drawer (Old Style)
9900-0259	Assembly, Power Controller
9900-0320	Assembly, Cable, 9 Socket to 25 Pin, Serial
9900-0344	Assembly, Cable Stay
9900-0513	Assembly, Colorwheel
9900-0519	Assembly, Cable, Power Harness Front Panel
9900-0701	Assembly, autoSCAN®-4 Reader
9900-0737	Assembly, Drawer Carrier
9900-0740	Assembly, autoSCAN®-4 Drawer (New Style)
9900-0743	Assembly, Opto Motor
9900-0954	Assembly, Power Supply Cable
9900-0955	Assembly, DC Fan
9900-0956	Assembly, Power Supply
9900-0960	Assembly, Cable, Enclosure Bottom
9900-1349	Assembly, Fan Cover
9900-1835	Assembly, Cable, Power Board/CW
9900-1837	Assembly, Cable, A/D - Photoboard
9900-2386	Assembly, Cable, A/D Interface

9900-2399  
9900-2431

Assembly, Cable, Photoboard  
Assembly, Bracket, CPU A/D

# PCB Assemblies

4230-0012  
4230-0015  
4230-0021  
4230-0051  
4230-0059  
4230-0098  
4230-0186  
4230-0188

PCB Assembly Drawing, Controller Board  
PCB Assembly Drawing, A/D Board  
PCB Assembly Drawing, LED Board  
PCB Assembly Drawing, Power Board  
PCB Assembly Drawing, Photoboard  
PCB Assembly Drawing, autoSCAN®-4 CPU II Board  
PCB Assembly Drawing, Photoboard II  
PCB Assembly, Drawing, A/D II Board

# Schematic Diagrams

4240-0012  
4240-0015  
4240-0021  
4240-0051  
4240-0059  
4240-0098  
4240-0186  
4240-0188

Schematic Diagram, Controller Board  
Schematic Diagram, A/D Board  
Schematic Diagram, LED Board  
Schematic Diagram, Power Board  
Schematic Diagram, Photoboard  
Schematic Diagram, autoSCAN®-4 CPU II Board  
Schematic Diagram, Photoboard II  
Schematic Diagram, A/D II Board

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MicroScan, Inc. - Instrumentation  
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Page # 1  
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Assembly Name 9700-0259  
Revision Level 502

RAW MATL KIT,PWR CONTROLLER  
Revision Date 2/02/96 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	----
1	1	3014-4001	SCREW LOCK ASSY.	2.000	EA
1	2	4100-0202	STAND-OFF,PC BOARD, 1.12"	2.000	EA
1	5	4301-1203	STRAPPING,NYLON,PERFORATED,3/8	1.000	FT
1	6	5081-2041	NUT,STNLS,SM,PROFILE,4-40	4.000	EA
1	7	5090-0106	WASHER,FLAT S.STEEL,#6	2.000	EA
1	8	5101-0403	SPACER,NYL,#4,3/16ODX7/16LONG	5.000	EA
1	9	5029-0486	SCR,HSFHMS,4-40 X 1/2,CS	2.000	EA
1	10	5029-0546	SCR,HSFHMS,4-40 X 3/4,SS	3.000	EA
1	11	5029-0589	SCR,HSFHMS,4-40X1	2.000	EA
1	12	5029-0383	SCR,FHMS,6/32 X 3/8,CS	2.000	EA
1	13	5532-0019	BRACKET,HEAT SINK MOUNT, AS-4	1.000	EA
1	14	5537-0120	SPACER DRAWER/POWER	1.000	EA
1	15	9900-0259	POWER CONTROLLER ASSY DWG, UL	1.000	RF
1	17	5090-1106	WASHER,NYLON,5/16" DIA,#6	2.000	EA
1	18	9010-0847	MPI,AS4 FUNCTIONAL TEST	1.000	RF
1	19	5081-1040	NUT, 4-40 HEX	2.000	EA
1	21	5601-0947	GASKET,METAL,SERIAL CABLE,AS4	1.000	EA

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Assembly Name 9700-0701  
Revision Level 519

RAW MATERIAL KIT,AS-4  
Revision Date 2/22/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
1	2	5645-0004	FOOT,RUBBER,AS-4 & TS/SR	6.000	EA
1	3	5028-0024	SCR,BHCS,8-32X3/8,SS	6.000	EA
1	5	5028-0023	SCR,BHCS,6-32 X 1/4	9.000	EA
1	6	3004-1033	SOCKET,PWR,LINE FILTER,AS-4	1.000	EA
1	7	5532-0021	BRACKET,PWR RECEPT MOUNT,AS-4	1.000	EA
1	8	3106-1211	FUSE,2.OA 250V, SLOW BLOW 5X20	1.000	EA
1	9	5029-0012	SCR,HSCS,6-32 X 3/8,SS	7.000	EA
1	10	9800-0960	CABLE ASSY,ENCL BTM,AS-4	1.000	EA
1	11	4302-0003	CABLE CLAMP, 3/8"	3.000	EA
1	12	4311-0800	TUBING,HEAT SHRINK,FLEX,1/8"	.500	EA
1	13	3001-1854	WIRE,GRN/YEL,18AWG	.500	FT
1	14	3031-0301	BARRIER STRIP,3 POSITION	1.000	EA
1	15	3035-0301	JUMPER BARRIER STRIP	1.000	EA
1	16	5029-0279	SCR,HSCS,6-32 X 1/2,CS	4.000	EA
1	19	5400-2725	LBL,FRONT PNL,AS4,DADE BEHRING	1.000	EA
1	20	5090-0606	WASHER,LOCKING,INT.TOOTH,#6	13.000	EA
1	21	4500-1022	SWITCH, PUSHBUTTON ALT.ACTION	1.000	EA
1	22	3100-4205	SWITCH,PB,READ	1.000	EA
1	23	3100-9217	SWITCH CAP,GREEN	1.000	EA
1	24	3100-9218	SWITCH CAP,BLACK	1.000	EA
1	26	4302-0001	CLAMP, FLAT CABLE	6.000	EA
1	27	9800-0519	ASSY,CABLE,PWR HARNESS FRT PAN	1.000	EA
1	28	4220-0021	PCB ASSY,LED,AS-4	1.000	EA
1	29	5028-0021	SCR,BHCS,4-40X1/4,AS	10.000	EA
1	30	5090-0404	WASHER,LOCKING,SPLIT,#4	1.000	EA
1	31	9800-0344	ASSY,CABLE STAY	1.000	EA
1	33	5090-0604	WASHER,LOCK,STAR,INT,SS#4	6.000	EA
1	36	6500-0171	SHIELD DRAWER,FRONT, AS-4	1.000	EA
1	40	5532-0022	BRACKET,FLAT RETAINING,AS-4	1.000	EA
1	41	5400-1703	CLAMP,FRONT,SST PLATE, AS-4	1.000	EA
1	42	5203-0863	ALL,THREAD,8/32X6.275"	2.000	EA
1	44	5082-0081	NUT, COLOR WHEEL TOP HOLD DOWN	2.000	EA
1	45	4311-0400	TUBING,HEAT SHRINK,FLEX,1/16"	.500	FT
1	47	0307-4705	CAP,TANT,47MF,25V	1.000	EA
1	48	3100-4204	SWITCH,PUSH BUTTON,RESET	2.000	EA
1	49	0109-1008	CAP,MONO,.01MF,50VDC +/-20%	1.000	EA
1	50	5532-0025	BRACKET,ENCL.BOTTOM, AS-4	1.000	EA
1	51	5029-0118	SCR,FHMS,6-32 X 3/8,SS	2.000	EA
1	53	5029-0136	SCR,FHMS,10-32 X 1/2,SS	4.000	EA
1	54	5029-0272	SCR,HSCS,4-40 X 3/8,CS	2.000	EA
1	55	5090-0106	WASHER,FLAT S.STEEL,#6	10.000	EA
1	57	5029-0017	SCR,HSCS,8-32 X 1/4,SS	2.000	EA
1	58	5029-0009	SCR,HSCS,4-40 X 1/2,SS	1.000	EA
1	60	5534-0007	COVER PLATE, AS-4	1.000	EA
1	62	4220-0186	ASSY,PCB,PHOTO BOARD II	1.000	EA



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Assembly Name 9700-0701  
Revision Level 519

RAW MATERIAL KIT,AS-4  
Revision Date 2/22/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
1	63	5102-0408	STANDOFF,4-40X1/2 OD,STL,HEX	4.000	EA
1	64	4220-0188	ASSY,PCB,A/D BOARD II, AS-4	1.000	EA
1	65	4220-0098	ASSY,PCB,AS4 CPU II	1.000	EA
1	67	3003-3005	CORD,POWER,3-18 GAUGE	1.000	EA
1	68	5536-1001	SHIELD,PHOTODIODE,AS-4	1.000	EA
1	69	5639-0001	DIFFUSER GLASS, AS-4	1.000	EA
1	71	5634-0006	CLIP,DIFFUSER,RETAINING,AS-4	1.000	EA
1	72	5634-0007	CLIP,DIFFUSER,RETAINING,R,AS4	1.000	EA
1	74	8000-1006	LABEL,WARNING,RISK OF ELEC SHK	1.000	EA
1	75	8000-1201	LABEL,WARNING,FUSE REPLACEMENT	1.000	EA
1	76	8000-1202	LABEL,WARNING,LAMP REPLACEMENT	1.000	EA
1	77	9800-0320	CABLE,9 SOCKET TO 25 PIN,SERIA	1.000	EA
1	78	3026-0618	TERMINAL,#6 LOCKING,LUG	1.000	EA
1	79	3036-0301	COVER,BARRIER STRIP,3 POSITION	1.000	EA
1	81	5532-0004	BRACKET,GRD,SHIELD,CARD A,AS-4	1.000	EA
1	88	5090-0406	WASHER,LOCKING,SPLIT,NO.6	2.000	EA
1	91	8993-0002	PACKING INSTR,AS-4 DIFFUSER	1.000	RF
1	92	4311-1604	TUBING,HEAT SHRINK 3/8,BLACK	.200	FT
1	93	4311-1200	TUBING,HEAT SHRINK,FLEX,3/16"	.100	FT
1	95	3017-0009	TRMNL,FML-DSCNT,NYLN INSLTD	1.000	EA
1	100	5028-0026	SCR,BHCS,6-32 X 3/8,SS	4.000	EA
1	101	5601-0172	LOCTITE 242	.001	EA
1	105	3100-6114	SWITCH,MOMENTARY,DP,PANEL MNT	1.000	EA
1	106	5400-0331	BRACKET,LINE INTERRUPT SWITCH	1.000	EA
1	107	5029-0011	SCR,HSCS,6-32 X 5/16,SS	2.000	EA
1	108	5090-0104	WASHER,FLAT S.STEEL,#4	6.000	EA
1	109	5601-0244	LOCTITE 454	.001	OZ
1	110	5400-2722	COVER,BOTTOM,AS-4 DADE BEHRING	1.000	EA
1	111	5400-2721	COVER,TOP,AS-4 DADE BEHRING	1.000	EA
1	112	5400-1701	HINGE,FEMALE,FULL ACTION, AS-4	2.000	EA
1	113	5400-1705	HINGE,MALE, FULL ACTION, AS-4	2.000	EA
1	114	5400-1702	PLATE, HINGE MOUNT, AS-4	4.000	EA
1	115	5028-0037	SCR,BHCS,6-32 X 5/8	8.000	EA
1	116	5400-2471	LATCH,STRIKER,TSSR	2.000	EA
1	117	5669-0000	HOUSING,LATCH STRIKER	2.000	EA
1	118	5081-1041	NUT,HEX,4-40	2.000	EA
1	122	9800-1835	ASM,CABLE,POWER BD/CW	1.000	EA
1	123	9800-2399	ASSY,CABLE,PHOTO BRD,AS/4	1.000	EA
1	125	9800-2386	ASSY,CABLE ,A/D INTERFACE,AS4	1.000	EA
1	126	5028-0022	SCR,BHCS,4-40 X 3/8	2.000	EA
1	127	5400-2566	COVER,SHIELD,A/D CPU BRD,AS-4	1.000	EA
1	131	5400-2724	LABEL,PRODUCT,AS4,EURO,DBEHRNG	1.000	EA
1	131	5400-2735	LBL,PROD.,AS4,EURO,BLANK,DBEHR	.000	EA
1	132	8100-2333	ENVELOPE,DHR,AS/4	1.000	EA

Pgm BM00119R  
Time 16:54:14

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Assembly Name 9700-0740  
Revision Level 504

RAW MATL KIT DRAWER,AS-4,  
Revision Date 1/04/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
1	3	5400-0936	PLATE, LEFT SIDE	1.000	EA
1	4	5400-0937	PLATE, RIGHT SIDE	1.000	EA
1	5	5531-0015	PLATE DRAWER BASE ASSY.	1.000	EA
1	6	5531-0020	PLATE DR CROSSBRACE, AS-4	2.000	EA
1	7	5532-0014	BRACKET,SIDE PLATE, AS-4	1.000	EA
1	8	5530-0001	BLOCK,FIBER BUNDLE,AS-4	1.000	EA
1	9	5531-0009	PLATE FIBER BK MOUNTING, AS-4	2.000	EA
1	10	4400-0622	ASSY,COLLIMATION BLOCK	1.000	EA
1	11	5532-0009	BRACKET,UPPER,COL,BLK,AS-4	2.000	EA
1	12	5400-0938	SUPPORT, LEFT FRONT SHAFT	1.000	EA
1	13	5400-0939	SUPPORT, LEFT REAR SHAFT	1.000	EA
1	14	5400-0940	SUPPORT, RIGHT FRONT SHAFT	1.000	EA
1	15	5400-0941	SUPPORT, RIGHT REAR SHAFT	1.000	EA
1	16	5400-0942	ASSY, FRONT SPINDLE	1.000	EA
1	18	5532-0017	OPTO MOUNT, AS-4	1.000	EA
1	19	5400-0943	BRACKET, OPTO SUPPORT	1.000	EA
1	20	5400-0944	SPINDLE, REAR	1.000	EA
1	21	5400-0945	SHAFT, FIXED RIGHT SIDE	1.000	EA
1	22	5400-0946	SHAFT, FLOATING LEFT SIDE	1.000	EA
1	24	5531-0004	PLATE,APERTURE,AS-4	1.000	EA
1	25	5532-0142	BRACKET FIBER MOUNTING	1.000	EA
1	26	7400-0001	LIGHT GUIDE,105 LEG	1.000	EA
1	31	5634-0001	SPRING, .62" X .12",AS-4	1.000	EA
1	32	3101-3102	SOLENOID,PULL,12VDC,MOD	1.000	EA
1	33	5531-0003	PLATE,MOUNTING SOLENOID,AS-4	1.000	EA
1	34	5204-0099	ROLL PIN 3/32 DIA. X 3/8" L	1.000	EA
1	35	5203-0401	SCREW,SOCKET,HD SHLDR,4-40X1/8	4.000	EA
1	36	5400-0947	BLOCK, IDLER	1.000	EA
1	37	5400-0921	IDLER,SLEEVED	1.000	EA
1	38	5631-0103	PULLEY,TIMING,20 TOOTH,AS-4	1.000	EA
1	39	5400-0954	REAR PULLEY ASSY	1.000	EA
1	40	5400-0953	FRONT PULLEY ASSY	1.000	EA
1	41	5601-0283	BELT,TIMING,175 TOOTH	1.000	EA
1	42	5601-0197	BELT,TOOTHED,285 GROOVED	1.000	EA
1	43	5601-0284	SPACER,SHAFT	4.000	EA
1	44	5601-0235	RETAINER RINGS, E-CLIPS	4.000	EA
1	45	5086-1042	NUT,NYLON,4-40,HEX	4.000	EA
1	46	5090-1104	WASHER,FLAT,NYLON,#4	8.000	EA
1	47	5029-0546	SCR,HSPHMS,4-40 X 3/4,SS	4.000	EA
1	48	5029-0115	SCR,FHMS,4-40 X 1/2,SS	22.000	EA
1	49	5029-0009	SCR,HSCS,4-40 X 1/2,SS	2.000	EA
1	50	5029-0011	SCR,HSCS,6-32 X 5/16,SS	2.000	EA
1	51	5028-0035	SCR,BHCS,6-32 X 3/8	4.000	EA
1	52	5029-0012	SCR,HSCS,6-32 X 3/8,SS	2.000	EA
1	53	5029-0013	SCR,HSCS,6-32 X 7/16,SS	8.000	EA

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Assembly Name 9700-0740  
Revision Level 504

RAW MATL KIT DRAWER,AS-4,  
Revision Date 1/04/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1	54	5029-0020	SCR,HSCS,8-32 X 7/16,SS	14.000	EA
1	57	5029-0531	SCR,HSCS,8-32 X 1 1/4,SS	1.000	EA
1	58	5029-0499	SCR,8-32 X 5/8,HSPHMS,CS	4.000	EA
1	59	5028-0034	SCR,BHCS 10-32 X 3/8	4.000	EA
1	60	5029-0015	SCR,HSCS,6-32 x 5/8,SS	2.000	EA
1	61	5090-0406	WASHER, LOCKING, SPLIT, NO. 6	18.000	EA
1	62	5090-0408	WASHER, LOCKING, SPLIT, #8	15.000	EA
1	63	5090-0106	WASHER, FLAT S. STEEL, #6	8.000	EA
1	64	5090-0108	WASHER, FLAT S. STEEL, #8	5.000	EA
1	65	5028-0022	SCR, BHCS, 4-40 X 3/8	2.000	EA
1	66	5601-0205	LOCTITE 242 (1.69 FL.OZ.)	.001	EA
1	67	5601-0240	LOCTITE 271, RED	.001	EA
1	70	3015-2154	CONN, 2 PIN, RECEPTACLE	1.000	EA
1	71	3015-2152	PIN, TERMINAL, CRIMP	2.000	EA
1	72	5601-0924	MOUNT, CABLE, ADHESIVE, 4-WAY	7.000	EA
1	73	5204-0100	PIN, ROLL, 3/16 X 3/4"	1.000	EA
1	74	5601-0028	WAVE WASHER 1/4", SHAFT	4.000	EA
1	75	4301-1201	TIES, CABLE, 6"	7.000	EA
1	77	5090-0410	WASHER, LOCKING, SPLIT, NO. 10	4.000	EA
1	78	5090-0110	WASHER, FLAT S. STEEL, #10	4.000	EA

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Effectivity Date for ECN: 0/00/00  
Required Effectivity Date: 5/11/99

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Date 5/11/99

Assembly Name 9700-0956  
Revision Level 506

RAW MATL KIT,PWR SPPLY ASY,AS4  
Revision Date 12/21/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	----
1	1	9900-0956	ASSY DWG, POWER SUPPLY AS-4	1.000	RF
1	2	4200-0018	POWER SUPPLY, 12V, 9A, AUTO-V	1.000	EA
1	3	3017-0028	BARRIER BLOCK	1.000	EA
1	4	5400-1190	BRACKET, POWER SUPPLY	1.000	EA
1	5	5400-1191	BRACKET, L/S PWR SUP	1.000	EA
1	6	5400-1192	BRACKET, R/S PWR SUP	1.000	EA
1	8	5029-0011	SCR, HSCS, 6-32 X 5/16, SS	4.000	EA
1	9	5029-0015	SCR, HSCS, 6-32 X 5/8, SS	4.000	EA
1	10	5090-0406	WASHER, LOCKING, SPLIT, NO. 6	12.000	EA
1	11	5029-0016	SCR, HSCS, 6-32 X 3/4, SS	4.000	EA
1	12	1615-1016	THERMAL COMPOUND, 1LB. PKG.	.001	EA
1	13	3017-0013	JUMPER CLIPS, 141	1.000	EA
1	14	5029-0381	SCR, FHMS, 6/32 X 1/4, CS	4.000	EA
1	15	2212-0109	CURRENT LIMITER (THERMISTOR)	1.000	EA
1	16	5090-0410	WASHER, LOCKING, SPLIT, NO. 10	2.000	EA
1	17	5029-0029	SCR, HSCS, 10-32 X 7/16, SS	2.000	EA
1	18	8100-2126	BAG, STATIC SHIELDING, 12 X 18	1.000	EA
1	19	4200-0021	HEATSINK, MOD, AS-4	1.000	EA
1	20	5090-0106	WASHER, FLAT S. STEEL, #6	4.000	EA
1	22	5601-1007	SOLDER, SN63 WIRE, NO CLEAN FLX	.001	EA



STAMPED  
IN RED ON ORIGINAL

Bill Of Materials In Bubble # Sequence  
Effectivity Date for ECN: 11/11/91

11/13/91  
obsolete oia  
ECN-01-4957  
4-30-92  
p. auto

Number of Levels Exploded 1  
Assembly 9800-0132  
Assembly 9800-0132  
Assembly Name 9800-0132  
Revision Level 516

Build Quantity 1

DRAWER ASSEMBLY  
Revision Date 11/08/91

Make Class 04 ECN 01-4449 Stock U/M EA  
Batch Size 1 Low Level Code 4

Prod Group AS4

Level	Bubble #	Component	Component Description	Batch	Required Quantity	Total Quantity	Rev U/M Lvl ECN	Effectivity Dates
	1	9900-0132	ASSY DRAWING, DRAWER ASSY		1.000	1.000	RF 507 01-2008	10/21/87 12/31/99
	2	3101-3102	SOLENOID, PULL, 12VDC, MOD		1.000	1.000	EA 504 01-0727	10/21/87 12/31/99
	3	9800-0411	ASSY, WIRING AS-4	1	1.000	1.000	EA 503 01-0746	8/01/88 12/31/99
	5	4400-0622	ASSY, COLLIMATION BLOCK		1.000	1.000	EA 504 01-0918	10/21/87 12/31/99
	6	5101-0006	SPACER, BEARING		2.000	2.000	EA 501	10/21/87 12/31/99
	7	5601-0332	PLUNGER BALL, 10-32 THD		2.000	2.000	EA 501 01-4129	4/01/91 12/31/99
	9	5530-0001	BLOCK, FIBER BUNDLE, AS-4		1.000	1.000	EA 520 01-4118	10/21/87 12/31/99
	10	5530-0002	BLOCK, TRAY DRAWER, AS-4		1.000	1.000	EA 510 01-3215	10/21/87 12/31/99
	11	5530-0004	BLOCK, DRAWER MOUNTING, AS-4		1.000	1.000	EA 505 01-0306	10/21/87 12/31/99
	12	5530-0005	BLOCK, DRAWER FT. SUPPORT, AS-4		1.000	1.000	EA 505 01-2891	10/21/87 12/31/99
	13	5530-0006	BLOCK, SPACER DR. RAIL, AS-4		4.000	4.000	EA 506 09-0665	10/21/87 12/31/99
	14	5531-0003	PLATE, MOUNTING SOLENOID, AS-4		1.000	1.000	EA 502 01-0380	10/21/87 12/31/99
	15	5531-0004	PLATE, APERTURE, AS-4		1.000	1.000	EA 510 01-3417	10/21/87 12/31/99
	16	5531-0006	PLATE DRAWER RT. SIDE, AS-4		1.000	1.000	EA 508 09-0665	10/21/87 12/31/99
	17	5531-0007	PLATE, DRAWER, LEFT SIDE, AS-4		1.000	1.000	EA 510 01-0971	10/21/87 12/31/99
	18	5531-0009	PLATE FIBER BK MOUNTING, AS-4		2.000	2.000	EA 508 01-1447	8/01/88 12/31/99
	19	5531-0011	PLATE TRAY BLK SUPPORT, AS-4		1.000	1.000	EA 507 01-1504	10/21/87 12/31/99
	20	5531-0015	PLATE DRAWER BASE ASSY.		1.000	1.000	EA 511 01-2651	10/21/87 12/31/99
	21	5531-0016	PLATE DRAWER LEFT SUPPORT		1.000	1.000	EA 511 01-1857	10/21/87 12/31/99
	22	5531-0017	PLATE DRAWER RIGHT SUPPORT		1.000	1.000	EA 513 01-1857	10/21/87 12/31/99
	23	5531-0020	PLATE DR CROSSRACE, AS-4		2.000	2.000	EA 508 09-0665	8/01/88 12/31/99

From Assembly 9800-0132  
To Assembly 9800-0132

Build Quantity 1

Assembly Name 9800-0132  
Revision Level 516

DRAWER ASSEMBLY  
Revision Date 11/08/91

Make

Class 04 ECN 01-4449  
Batch Size 1

Stock U/M EA  
Low Level Code 4

Prod Group AS4

Level	Bubble #	Component	Component Description	Batch	Required Quantity	Total Quantity	Rev U/M Lvl ECN	Effectivity Dates
1	24	5532-0008	BRACKET,DR SIDE PANEL,AS-4		1.000	1.000	EA 505 09-0665	10/21/87 12/31/99
1	25	5532-0009	BRACKET,UPPER,COL,BLK,AS-4		2.000	2.000	EA 504 01-0295	10/21/87 12/31/99
1	26	5532-0011	IDLER MOUNT, AS-4		1.000	1.000	EA 504 01-0294	10/21/87 12/31/99
1	27	5532-0014	BRACKET,SIDE PLATE, AS-4		1.000	1.000	EA 505 09-0665	10/21/87 12/31/99
1	28	5532-0017	OPTO MOUNT, AS-4		1.000	1.000	EA 504 01-0295	10/21/87 12/31/99
1	29	5532-0018	FLAG DRAWER, OPEN, AS-4		1.000	1.000	EA 506 01-0266	10/21/87 12/31/99
1	30	5532-0030	BRACKET,TOOLING BALL, AS-4		1.000	1.000	EA 506 01-0280	10/21/87 12/31/99
1	31	5532-0142	BRACKET FIBER MOUNTING		1.000	1.000	EA 504 01-1017	10/21/87 12/31/99
1	32	5537-0002	SHAFT,AXI E,DR,AS-4		1.000	1.000	EA 503 01-0917	10/21/87 12/31/99
1	33	5539-0003	PANEL,DRAWER,FRONT,AS-4		1.000	1.000	EA 517 01-2891	10/21/87 12/31/99
1	34	5631-0100	GEAR RACK DRW ASSY,L,AS-4		1.000	1.000	EA 506 01-1456	10/21/87 12/31/99
1	35	5631-0101	GEAR RACK DRW. ASSY,R,AS4		1.000	1.000	EA 508 01-2170	10/21/87 12/31/99
1	36	5631-0102	PULLEY,TIMINGBELT,48 TOOTH,AS4		1.000	1.000	EA 502 01-2171	10/21/87 12/31/99
1	37	5631-0103	PULLEY,TIMING,20 TOOTH,AS-4		1.000	1.000	EA 503 01-3929	10/21/87 12/31/99
1	38	5631-0104	GEAR,DELTRIN,SPUR DMR.ASSY,AS4		2.000	2.000	EA 501	10/21/87 12/31/99
1	39	5632-0002	TIMING BELT, DRWR, 135 GRV		1.000	1.000	EA 502 01-2949	10/21/87 12/31/99
1	40	5601-0025	IDLER BEARINGS		1.000	1.000	EA 503 01-2463	1/15/88 12/31/99
1	41	5633-0101	BEARING,BALL,DS,FL, ABEC 3		2.000	2.000	EA 503 01-2355	10/21/87 12/31/99
1	42	5633-0102	BUSHING BEARING ADAPT,AS-4		8.000	8.000	EA 505 01-0294	10/21/87 12/31/99
1	43	5634-0001	SPRING, .62" X .12",AS-4		1.000	1.000	EA 502 420	10/21/87 12/31/99
1	44	5634-0004	SPRING,EXT .88 LONG X .12 DIA		2.000	2.000	EA 502 01-2780	10/21/87 12/31/99

Effectivity Date for ECN: 11/11/91

Number of Levels Exploded 1  
 Assembly 9800-0132  
 Assembly 9800-0132

Build Quantity 1

Material Name 9800-0132  
 Revision Level 516

DRAWER ASSEMBLY  
 Revision Date 11/08/91

Make

Class 04 ECN 01-4449  
 Batch Size 1

Stock U/M EA  
 Low Level Code 4

Prod Group AS4

	Bubble #	Component	Component Description	Batch	Required Quantity	Total Quantity	Rev U/M Lvl ECN	Effectivity Dates
45	5636-1001	TRACK,DR,ASSY,AS-4			4.000	4.000	EA 503 01-1288	5/02/89 12/31/99
46	5637-0102	WHEEL GUIDE INR. ASSY,AS-4			8.000	8.000	EA 503 01-2168	10/21/87 12/31/99
47	5639-0102	TONING BALL,STANDARD			1.000	1.000	EA 501	10/21/87 12/31/99
48	7400-0001	LIGHT GUIDE,105 LEG			1.000	1.000	EA 514 01-3487	10/21/87 12/31/99
56	5010-0402	SCREW SET, 4-40			1.000	1.000	EA 501	10/21/87 12/31/99
57	5010-0802	SCREW SET, 8-32			1.000	1.000	EA 501	10/21/87 12/31/99
58	5086-1042	NUT,NYLON,4-40			4.000	4.000	EA 501	10/21/87 12/31/99
59	5090-0108	WASHER,FLAT S.STEEL,#8			8.000	8.000	EA 506 01-4214	10/21/87 12/31/99
60	5090-0110	WASHER,FLAT S.STEEL,#10			1.000	1.000	EA 503 01-3231	10/21/87 12/31/99
61	5090-0406	WASHER,LOCKING,SPLIT,NO.6			2.000	2.000	EA 502 01-2322	10/21/87 12/31/99
62	5090-0408	WASHER,LOCKING,SPLIT,#8			6.000	6.000	EA 501	10/21/87 12/31/99
63	5090-0410	WASHER,LOCKING,SPLIT,NO.10			1.000	1.000	EA 502 01-2323	10/21/87 12/31/99
64	5090-1104	WASHER,FLAT,NYLON,#4			6.000	6.000	EA 501	4/27/88 12/31/99
65	5203-0401	SCREW,SOCKET,HD SHLDR,4-40X1/8			4.000	4.000	EA 501	10/22/87 12/31/99
66	5203-0803	SCREW,SOCKET,HD SHLDR,8/32X1/4			3.000	3.000	EA 501	12/04/89 12/31/99
67	5204-0099	ROLL PIN 3/32 DIA. X 3/8" L			1.000	1.000	EA 501 01-0560	10/22/87 12/31/99
68	5204-0100	PIN,ROLL, 3/16 X 3/4"			1.000	1.000	EA 502 01-2449	10/22/87 12/31/99
70	5029-0546	SCR,HSFHMS,4-40 X 3/4,SS			4.000	4.000	EA 502 01-2106	11/10/88 12/31/99
72	5029-0499	SCREW,8-32 X 5/8,HSFHMS,CS			4.000	4.000	EA 502 01-2598	2/28/90 12/31/99
73	5028-0022	SCR,BHCS,4-40 X 3/8			4.000	4.000	EA 511 01-2107	1/15/88 12/31/99
74	5028-0035	SCR,BHCS,6-32 X 3/8			4.000	4.000	EA 511 01-2108	1/15/88 12/31/99

Bill Of Materials In Bubble # Sequence  
Effectivity Date for ECN: 11/11/91

Number of Levels Exploded 1  
From Assembly 9800-0132  
Assembly 9800-0132

Build Quantity 1

Assembly Name 9800-0132  
Revision Level 516

IRAWER ASSEMBLY  
Revision Date 11/08/91

Make

Class 04 ECN 01-4449  
Batch Size 1

Stock U/M EA  
Low Level Code 4

Prod Group AS4

Level	Bubble #	Component	Component Description	Batch	Required Quantity	Total Quantity	Rev U/M Lvl ECN	Effectivity Dates
1	75	5028-0037	SCR,RHCS,6-32 X 5/8		8.000	8.000	EA 511 01-2108	1/15/88 12/31/99
1	76	5326-1005	SCR,RHCS,10-32X3/8,ALY		4.000	4.000	EA 100 09-0393	10/22/87 12/31/99
1	77	5326-1009	SCR,RHCS,10-32X1,ALY		1.000	1.000	EA 502 01-2779	10/22/87 12/31/99
1	78	5029-0586	SCR,HSCS,0-80 X 3/8,SS		6.000	6.000	EA 501	11/11/91 12/31/99
1	79	5028-0026	SCR,RHCS,6-32 X 3/8,SS		6.000	6.000	EA 511 01-2108	10/01/88 12/31/99
1	80	5029-0286	SCR,HSCS,8-32 X 1/2,CS		12.000	12.000	EA 506 01-2105	10/01/88 12/31/99
1	81	5029-0288	SCR,HSCS,8-32 X 3/4,CS		17.000	17.000	EA 506 01-2105	1/15/88 12/31/99
1	82	5029-0290	SCR,HSCS,8-32 X 1,CS		4.000	4.000	EA 506 01-2105	1/15/88 12/31/99
1	83	0511-1007	CAP,MONO,.1HF,100V		1.000	1.000	EA 502 01-0253	10/22/87 12/31/99
1	84	3001-2266	WIRE,BLU,22AWG		.250	.250	FT 505 01-2332	10/22/87 12/31/99
1	85	3011-1502	CONNECTOR HOUSING PLUG		1.000	1.000	EA 503 01-2332	10/22/87 12/31/99
1	86	3013-2205	PIN,SOCKET,CRIMP,20-24AWG		9.000	9.000	EA 503 01-2257	10/20/89 12/31/99
1	87	4301-1201	TIES, CABLE, 6"		17.000	17.000	EA 503 01-2332	10/20/89 12/31/99
1	88	4302-0001	CLAMP, FLAT CABLE		2.000	2.000	EA 503 01-1979	10/22/87 12/31/99
1	89	4311-0800	TUBING,HEAT SHRINK,FLEX,1/8"		.100	.100	FT 504 01-2779	10/22/87 12/31/99
1	90	5325-0607	SCREW6-32X5/8FLT.HISOCKT.HDCAP		4.000	4.000	EA 001	10/27/87 12/31/99
1	91	4200-0203	MOTOR,STEPPER,5.4VDC		1.000	1.000	EA 512 01-3541	4/11/88 12/31/99
1	92	5601-0240	LOCTITE 271,RED		.001	.001	EA 501 01-4129	12/04/89 12/31/99
1	93	9010-0002	MPI,DRAWER ASSY		1.000	1.000	RF 502 01-2008	12/04/89 12/31/99
1	94	5203-1803	SCREW,SHD SHDR,8-32X1/4"MOD		1.000	1.000	EA 501	12/04/89 12/31/99
1	95	5029-0378	SCR,FHMS,4-40 X 3/8,CS		4.000	4.000	EA 506 01-2106	12/04/89 12/31/99
1	96	5601-0172	LOCTITE 242		.001	.001	EA 501 01-0421	12/04/89 12/31/99
1	99	5601-0160	WASHER #6, LAMINATED		16.000	16.000	EA 502 01-0638	12/04/89 12/31/99



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Date 5/11/99

Assembly Name 9800-0259  
Revision Level 516

POWER CONTROLLER ASSY, UL APP.  
Revision Date 1/22/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	3	4220-0012	PC BOARD ASSY,AS-4 CONTROL	1.000	EA
1	4	4220-0051	PC BOARD ASSY, POWER, UL APP	1.000	EA
1	15	9900-0259	POWER CONTROLLER ASSY DWG, UL	1.000	RF
1	18	9010-1232	MPI,TEST,AS-4 PWR CNTRLR	1.000	RF
1	20	9700-0259	RAW MATL KIT,PWR CONTROLLER	1.000	EA

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Assembly Name 9800-0320  
Revision Level 508

CABLE,9 SOCKET TO 25 PIN,SERIA  
Revision Date 2/07/94 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-0320	ASSY DWG,CABLE,AS TO 25P,SERIA	1.000	RF
1	2	3002-5000	CABLE,5 COND,24AWG,SHIELDED	8.500	FT
1	3	3015-2439	HOOD,9-PIN METALIZED PLASTIC	1.000	EA
1	4	3015-2440	HOOD,25 PIN METALIZED PLASTIC	1.000	EA
1	5	3015-2098	CONN, SUBMINIATURE "D" 9S	1.000	EA
1	6	3005-2501	CONN,DP-25P,MALE	1.000	EA
1	9	4311-0400	TUBING,HEAT SHRINK,FLEX,1/16"	1.000	FT
1	10	5601-0213	FLUX, SOLDER	.001	GL

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Required Effectivity Date: 5/11/99

Page # 1  
Date 5/11/99

Assembly Name 9800-0344  
Revision Level 503

ASSY,CABLE STAY  
Revision Date 7/24/91 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	5669-0005	CABLE,FITTING,CABLE,STAY	2.000	EA
1	2	5669-0006	CABLE,STNLS,NYLON,COATED	.750	FT
1	3	9010-0770	MPI,CABLE STAY ASSEMBLY	1.000	RF
1	4	9900-0344	ASSY DWG,CABLE STAY	1.000	RF

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Required Effectivity Date: 5/11/99

Page # 1  
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Assembly Name 9800-0513  
Revision Level 526

COLORWHEEL ASSEMBLY  
Revision Date 4/09/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1	1	9900-0513	ASSY DWG,COLORWHEEL AS-4	1.000	RF
1	3	5531-0002	PLATE,30MM LENS, AS-4	1.000	EA
1	5	5029-0286	SCR,HSCS,8-32 X 1/2,CS	12.000	EA
1	6	5090-0408	WASHER,LOCKING,SPLIT,#8	12.000	EA
1	7	5631-1002	PULLY,TIMINGBELT,30T, 1/4"BORE	1.000	EA
1	8	5601-0810	BEARING,CAM ROLLER	1.000	EA
1	9	5400-2315	MOUNT,MODIFIED,IDLER	1.000	EA
1	10	5400-2316	STUD,BEARING	1.000	EA
1	11	5533-0001	CHASSIS,CLRWHL,ENCLOSURE	1.000	EA
1	14	3011-1501	HOUSING CONNECTOR CAP	1.000	EA
1	15	5327-0305	SCREW HSCS M3X0.5PX10MM	4.000	EA
1	16	5090-0404	WASHER,LOCKING,SPLIT,#4	8.000	EA
1	19	7112-0007	LENS,ASPHERIC,30MM DIA,AS-4	1.000	EA
1	20	7121-0030	COLLIMATOR TUBE,30MM	1.000	EA
1	21	7112-0019	LENS,ASPHERIC,65MM DIA,AS-4	1.000	EA
1	22	7121-0065	COLLIMATOR TUBE,65MM	1.000	EA
1	23	7211-0101	MIRROR,HOT,65MM DIAMETER	1.000	EA
1	24	5201-0103	CLIP, RING, HOT MIRROR	1.000	EA
1	25	5537-0001	SHAFT,AXLE,AS-4,CW	1.000	EA
1	26	5095-0931	WASHER,COLORWHEEL SHAFT,AS-4	1.000	EA
1	27	5631-1001	PULLEY,TIMING BELT,90 TOOTH	1.000	EA
1	28	5632-1001	BELT,PULLY,AS-4,COLORWHEEL	1.000	EA
1	32	5326-1009	SCR,BHCS,10-32X1,ALY	1.000	EA
1	33	5090-0110	WASHER,FLAT S.STEEL,#10	1.000	EA
1	34	5090-0410	WASHER,LOCKING,SPLIT,NO.10	1.000	EA
1	35	5400-2325	COLOR WHEEL,MODIFIED	1.000	EA
1	36	5601-0764	INTERFERENCE FILTER,620NM,AS-4	1.000	EA
1	37	5601-0763	INTERFERENCE FILTER,590NM,AS-4	1.000	EA
1	38	5601-0762	INTERFERENCE FILTER,560NM,AS-4	1.000	EA
1	39	5601-0761	INTERFERENCE FILTER,505NM,AS-4	1.000	EA
1	40	5601-0760	INTERFERENCE FILTER,470NM,AS-4	1.000	EA
1	41	5601-0759	INTERFERENCE FILTER,440NM,AS-4	1.000	EA
1	42	5601-0811	O-RING,7/8" I.D., 50 DUR	6.000	EA
1	43	5201-0101	RING CLIP,RETAING,INTRNL 1"DIA	6.000	EA
1	44	5081-8251	NUT,KEPP,1/4-20,SS	1.000	EA
1	51	4302-0001	CLAMP, FLAT CABLE	6.000	EA
1	52	7450-0001	LAMP,TUNG,HALOGEN,13V,85W	1.000	EA
1	53	5539-0001	PANEL,SIDE,CW,AS-4	1.000	EA
1	54	5539-0002	PANEL,TOP,CW,AS-4	1.000	EA
1	55	5029-0012	SCR,HSCS,6-32 X 3/8,SS	8.000	EA
1	56	4200-0104	GUARD,FAN,2.44"	1.000	EA
1	57	4301-1201	TIES, CABLE, 6"	10.000	EA
1	58	5531-0001	PLATE,65MM LENS, AS-4	1.000	EA
1	59	3013-2205	PIN, SOCKET, CRIMP, 20-24AWG	15.000	EA
1	60	3100-9216	SWITCH,OPTICAL INTERRUPTER,AS4	1.000	EA



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MicroScan, Inc. - Instrumentation Page # 2  
Bill Of Materials In Bubble # Sequence Date 5/11/99  
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Assembly Name 9800-0513  
Revision Level 526

COLORWHEEL ASSEMBLY  
Revision Date 4/09/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	61	5052-0403	SCR,PHTCS,#4-40 X 1/4" LG	1.000	EA
1	62	5532-0003	BRACKET,OPTO INTERRUPT,AS-4	1.000	EA
1	63	4200-0202	MOTOR,STPPER,SINGLE SHAFT 10V	1.000	EA
1	65	5532-0146	BRACKET,LAMP,LOW V,2PIN	1.000	EA
1	66	3001-1822	WIRE,RED,18AWG	1.000	FT
1	67	3029-0116	TERMINAL,BUTT,INS,22-16AWG	2.000	EA
1	68	4200-0103	FAN,12V,2.44"	1.000	EA
1	69	5029-0009	SCR,HSCS,4-40 X 1/2,SS	2.000	EA
1	70	5029-0272	SCR,HSCS,4-40 X 3/8,CS	2.000	EA
1	71	9010-0001	MPI,AS-4 COLOR WHEEL PROCEDURE	1.000	RF
1	72	5601-0205	LOCTITE 242 (1.69 FL.OZ.)	.001	EA
1	73	5601-0482	GREASE, SILICONE, DOW 1292	.001	EA
1	75	5090-0106	WASHER,FLAT S.STEEL,#6	8.000	EA
1	76	5092-0012	WASHER,LOCKING,SPLIT #6	8.000	EA
1	77	5090-0108	WASHER,FLAT S.STEEL,#8	8.000	EA

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MicroScan, Inc. - Instrumentation Page # 1  
Bill Of Materials In Bubble # Sequence Date 5/11/99  
Effectivity Date for ECN: 0/00/00  
Required Effectivity Date: 5/11/99

Assembly Name 9800-0519 ASSY,CABLE,PWR HARNESS FRT PAN  
Revision Level 504 Revision Date 11/26/96 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-0519	ASSY DWG,CABLE,PWR HARNESS FRT	1.000	RF
1	2	3013-1206	CONN,CH,SINGLE PIN,18-24 AWG	9.000	EA
1	3	3012-0901	3008-0261 PLUG	1.000	EA
1	4	3001-1899	WIRE,WHT,18AWG	6.000	FT
1	5	3001-1800	WIRE,BLK,18AWG	6.000	FT
1	6	3001-2211	WIRE,BRN,22AWG	3.170	FT
1	7	3001-2291	WIRE,WHT/BRN,22AWG	3.170	FT
1	8	3001-2233	WIRE,ORG,22AWG	3.000	FT
1	9	3001-2293	WIRE,WHT/ORA,22AWG	3.000	FT
1	10	3001-1854	WIRE,GRN/YEL,18AWG	1.670	FT
1	12	3025-0618	TERMINAL,LUG,INS,22-18AWG,RND	1.000	EA
1	13	4301-1201	TIES, CABLE, 6"	13.000	EA
1	14	3017-0023	TRMNL,FML-DSCNCT,NYLN,INSLTD	4.000	EA
1	15	3017-0016	TRML,FML-DSCNT,NYLN,INSLTD,RED	2.000	EA
1	16	4313-0010	MARKER,CABLE TIE	1.000	EA

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MicroScan, Inc. - Instrumentation Page # 1  
Bill Of Materials In Bubble # Sequence Date 5/11/99  
Effectivity Date for ECN: 0/00/00  
Required Effectivity Date: 5/11/99

Assembly Name 9800-0701  
Revision Level 519

ASSY,READER,AS-4  
Revision Date 2/09/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1	1	9900-0701	ASSY DWG,READER,AS-4	1.000	RF
1	38	9800-0956	POWER SUPPLY ASSY,AS-4	1.000	EA
1	39	9800-1349	ASSY, FAN COVER, AS-4	1.000	EA
1	43	9800-0513	COLORWHEEL ASSEMBLY	1.000	EA
1	52	9800-0740	ASSY,DRAWER,AS-4	1.000	EA
1	56	9800-0259	POWER CONTROLLER ASSY, UL APP.	1.000	EA
1	94	9010-0025	MPI,AS-4 ASSEMBLY PROCEDURE	1.000	RF
1	102	9010-0809	MPI,ELECTRICAL SAFETY TEST	1.000	RF
1	103	9020-0808	CHECK LIST,ELEC.SAFETY TEST	1.000	RF
1	104	9010-1065	MPI,FINAL INSPECTION AND TEST	1.000	RF
1	119	9010-1066	MPI,AUTOSCAN-4 TEST DATA SHEET	1.000	RF
1	120	9700-0701	RAW MATERIAL KIT,AS-4	1.000	EA
1	121	9800-1542	ASSY,AS-4 WATER BLANK FILE	1.000	EA
1	128	9800-2431	ASSY,BRACKET,CPU A/D,AS-4	1.000	EA
1	130	9010-1041	ROUTER CHECK LIST	1.000	RF
1	133	9010-1282	MPI,AS-4 FINAL INSPECTION	1.000	RF
1	134	9012-1282	CHKLST,AS-4 FINAL INSPECTION	1.000	RF

Pgm BM00119R  
Time 16:54:55

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Assembly Name 9800-0737  
Revision Level 507

ASSY,DRAWER CARRIER  
Revision Date 10/31/94 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
1	1	9900-0737	ASSY DWG, DRAWER CARRIER	1.000	RF
1	2	5532-0008	BRACKET,DR SIDE PANEL,AS-4	1.000	EA
1	3	5400-0930	PLATE, DRAWER LEFT SIDE	1.000	EA
1	4	5400-0931	PLATE, DRAWER RIGHT SIDE	1.000	EA
1	6	5530-0004	BLOCK,DRAWER MOUNTING,AS-4	1.000	EA
1	7	5530-0002	BLOCK,TRAY DRAWER,AS-4	1.000	EA
1	8	5531-0011	PLATE TRAY BLK SUPPORT, AS-4	1.000	EA
1	9	5530-0005	BLOCK,DRAWER FT.SUPPORT,AS-4	1.000	EA
1	10	5539-0003	PANEL,DRAWER,FRONT,AS-4	1.000	EA
1	12	5634-0004	SPRING,EXT .88 LONG X .12 DIA	1.000	EA
1	13	5029-0115	SCR,FHMS,4-40 X 1/2,SS	4.000	EA
1	14	5029-0386	SCR,FHMS,6/32 X 5/8,CS	4.000	EA
1	15	5029-0020	SCR,HSCS,8-32 X 7/16,SS	10.000	EA
1	16	5029-0025	SCR,HSCS,8-32 X 1,SS	4.000	EA
1	17	5029-0586	SCR,HSCS,0-80 X 3/8,SS	6.000	EA
1	18	5090-0408	WASHER,LOCKING,SPLIT,#8	14.000	EA
1	19	5601-0278	SCREW, SHOULDER 4-40	2.000	EA
1	20	5400-0980	BRACKET, FLAG OPEN OPTO	1.000	EA
1	21	5601-0332	PLUNGER BALL,10-32 THD	2.000	EA
1	22	5601-0482	GREASE, SILICONE, DOW 1292	.001	EA
1	23	5601-0205	LOCTITE 242 (1.69 FL.OZ.)	.001	EA
1	24	5601-0240	LOCTITE 271,RED	.001	EA
1	25	5029-0058	SCR,PHMS,4-40 X 1/4,SS	2.000	EA
1	26	5400-0932	BLOCK, BEARING	4.000	EA
1	27	5601-0281	BEARING, LINEAR	4.000	EA
1	28	5601-0282	WASHER, RETAINING	8.000	EA
1	29	5400-0934	BRACKET, BELT CLAMP	1.000	EA
1	30	5400-0935	BRACKET, BELT	1.000	EA
1	31	5400-0933	PLATE, TENSIONER	1.000	EA
1	32	5601-0030	PRECISION PINS.0625	1.000	EA
1	33	5400-2457	POST,SPRING,.125 DIA X .25 LG	1.000	EA
1	34	5029-0011	SCR,HSCS,6-32 X 5/16,SS	4.000	EA
1	35	5090-0406	WASHER,LOCKING,SPLIT,NO.6	4.000	EA
1	36	5400-1409	DOOR GASKET	1.000	EA
1	37	5601-0244	LOCTITE 454	.001	OZ
1	38	9010-0997	MPI,DRAWER CARRIER	1.000	RF



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Time 16:55:00

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Assembly Name 9800-0740  
Revision Level 508

ASSY,DRAWER,AS-4  
Revision Date 5/04/92 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1	1	9900-0740	ASSY DWG,DRAWER AS-4	1.000	RF
1	2	9800-0737	ASSY,DRAWER CARRIER	1.000	EA
1	23	9800-0743	ASSY, OPTO MOTOR, AS-4	1.000	EA
1	76	9010-0996	MPI,DRAWER, AS-4, MAINFRAME	1.000	RF
1	79	9700-0740	RAW MATL KIT DRAWER,AS-4,	1.000	EA

Pgm BM00119R  
Time 16:55:07

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Assembly Name 9800-0743  
Revision Level 502

ASSY, OPTO MOTOR, AS-4  
Revision Date 8/12/93 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-0743	ASSY DWG, OPTO MOTOR, AS-4	1.000	RF
1	2	4200-0203	MOTOR, STEPPER, 5.4VDC	1.000	EA
1	4	4500-1024	SWITCH, OPTO, SLOTTED, W/WIRES	2.000	EA
1	5	3013-2205	PIN, SOCKET, CRIMP, 20-24AWG	15.000	EA
1	11	3001-2266	WIRE, BLU, 22AWG	2.160	FT
1	12	3015-2063	CONN, SCKT, BRASS/TIN, LPC	2.000	EA
1	13	3015-2153	CONN, 2 PIN, PLUG	1.000	EA
1	14	0511-1007	CAP, MONO, .1MF, 100V	1.000	EA
1	15	3011-1502	CONN, HOUSING PLUG	1.000	EA
1	16	4301-1201	TIES, CABLE, 6"	20.000	EA
1	17	4311-0800	TUBING, HEAT SHRINK, FLEX, 1/8"	.001	EA
1	18	4313-0010	MARKER, CABLE TIE	1.000	EA

Pgm BM00119R  
Time 16:55:14

MicroScan, Inc. - Instrumentation  
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Assembly Name 9800-0954  
Revision Level 502

P/S CABLE ASSY,AS-4  
Revision Date 8/05/94 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1		9900-0954	ASSY DWG, P/S CABLE AS-4	1.000	RF
1	1	3015-2204	PIN,AMP CONNECTOR	6.000	EA
1	2	3015-2205	CONN,5-PIN,LOCKING RAMP	1.000	EA
1	3	3015-2216	CONN,8-PIN,LOCKING RAMP	1.000	EA
1	4	4301-1201	TIES, CABLE, 6"	7.000	EA
1	5	4301-0802	GROMMET, 1/2"ID,3/4" PANEL,C.O.	1.000	EA
1	6	3025-0618	TERMINAL,LUG,INS,22-18AWG,RND	6.000	EA
1	7	3001-1844	WIRE,YLW,18AWG	.500	FT
1	8	3001-1866	WIRE,BLU,18AWG	.500	FT
1	9	3001-2269	WIRE,BLU/WHT,22AWG	.500	FT
1	10	3001-2249	WIRE,YEL/WHT,22AWG	.500	FT
1	11	3001-1800	WIRE,BLK,18AWG	.500	FT
1	12	3001-1899	WIRE,WHT,18AWG	.500	FT
1	13	4313-0010	MARKER,CABLE TIE	1.000	EA

Pgm BM00119R  
Time 16:55:21

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Assembly Name 9800-0955  
Revision Level 503

DC FAN ASSY,AS-4  
Revision Date 12/21/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1		9900-0955	ASSY DWG,DC FAN AS-4	1.000	RF
1	1	4200-0017	FAN,12VDC,26CFM	1.000	EA
1	2	3015-2204	PIN,AMP CONNECTOR	2.000	EA
1	3	3015-2205	CONN,5-PIN,LOCKING RAMP	1.000	EA
1	4	4311-1200	TUBING,HEAT SHRINK,FLEX,3/16"	1.000	FT
1	5	3001-2222	WIRE,RED,22AWG	.200	FT
1	6	3001-2200	WIRE,BLK,22AWG	.200	FT
1	7	4311-0400	TUBING,HEAT SHRINK,FLEX,1/16"	.200	FT
1	8	5601-1007	SOLDER,SN63 WIRE,NO CLEAN FLX	.001	EA



Pgm BM00119R  
Time 16:55:25

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Assembly Name 9800-0956  
Revision Level 507

POWER SUPPLY ASSY,AS-4  
Revision Date 6/19/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9800-0954	P/S CABLE ASSY,AS-4	1.000	EA
1	7	9900-0956	ASSY DWG,POWER SUPPLY AS-4	1.000	RF
1	21	9700-0956	RAW MATL KIT,PWR SPPLY ASY,AS4	1.000	EA
1	23	9010-0847	MPI,AS4 FUNCTIONAL TEST	1.000	RF
1	24	9012-0847	CHKLST,AS/4 POWER SUPPLY	1.000	RF

Pgm BM00119R  
Time 16:55:30

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Assembly Name 9800-0960  
Revision Level 506

CABLE ASSY, ENCL BTM, AS-4  
Revision Date 7/21/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-0960	ASSY DWG, CABLE ENCL BTM, AS-4	1.000	RF
1	2	3001-1822	WIRE, RED, 18AWG	1.750	FT
1	3	3001-1844	WIRE, YLW, 18AWG	2.750	FT
1	4	3001-1854	WIRE, GRN/YEL, 18AWG	7.750	FT
1	5	3001-1866	WIRE, BLU, 18AWG	2.750	FT
1	6	3001-1888	WIRE, GRY, 18AWG	1.750	FT
1	8	3001-2222	WIRE, RED, 22AWG	1.700	FT
1	9	3001-1899	WIRE, WHT, 18AWG	6.000	FT
1	10	3001-2211	WIRE, BRN, 22AWG	4.250	FT
1	11	3001-2233	WIRE, ORG, 22AWG	1.000	FT
1	12	3001-2277	WIRE, VIO, 22AWG	4.000	FT
1	13	3001-2290	WIRE, WHT/BLK, 22AWG	5.500	FT
1	14	3001-2219	WIRE, BRN/WHT, 22AWG	4.250	FT
1	15	3001-2239	WIRE, ORG/WHT, 22AWG	1.000	FT
1	16	3001-2249	WIRE, YEL/WHT, 22AWG	2.750	FT
1	17	3001-2269	WIRE, BLU/WHT, 22AWG	2.750	FT
1	18	3011-0901	CONN,	1.000	EA
1	19	3011-1201	CONN, 12 PIN	1.000	EA
1	20	3013-2205	PIN, SOCKET, CRIMP, 20-24AWG	10.000	EA
1	21	3013-2204	PIN, SOCKET, CRIMP 18-24	9.000	EA
1	23	3017-0024	TERMINAL, RING, NYLON INS.	2.000	EA
1	24	4301-1201	TIES, CABLE, 6"	51.000	EA
1	26	4301-0801	GROMMET, RUBBER, 1/2" I.D.	1.000	EA
1	27	3025-0618	TERMINAL, LUG, INS, 22-18AWG, RND	14.000	EA
1	28	3001-1800	WIRE, BLK, 18AWG	5.500	FT
1	29	4313-0010	MARKER, CABLE TIE	4.000	EA
1	30	9009-0010	ASSEMBLY BOARD, CABLE, AS-4	1.000	RF
1	31	3017-0027	TERM, RING #10, ROUND	1.000	EA
1	32	3017-0023	TRMNL, FML-DSCNCT, NYLN, INSLTD	4.000	EA
1	33	3015-2640	CONN, PLUG, FEMALE COUPLER	2.000	EA
1	34	3015-2048	CONN, SCKT, 2 POS, HSG	3.000	EA
1	35	3015-2157	CONN, SINGLE SOCKET CRIMP TERM	4.000	EA

Pgm BM00119R  
Time 16:55:35

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Assembly Name 9800-1349  
Revision Level 501

ASSY, FAN COVER, AS-4  
Revision Date 7/28/91 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
----	-----	-----	-----	-----	---
1	1	9900-1349	ASSY DWG, FAN COVER, AS-4	1.000	RF
1	2	5400-1704	COVER, POWER SUPPLY, AS-4	1.000	EA
1	3	5028-0036	SCR, BHCS, 6-32 X 1/2	4.000	EA
1	4	9022-0001	FILTER ELEMENT, FAN	1.000	EA
1	5	5029-0012	SCR, HSCS, 6-32 X 3/8, SS	4.000	EA
1	6	5090-0606	WASHER, LOCKING, INT. TOOTH, #6	4.000	EA
1	7	5081-1061	NUT, HEX, 6-32	4.000	EA
1	8	3001-1854	WIRE, GRN/YEL, 18AWG	.500	FT
1	9	3025-0618	TERMINAL, LUG, INS, 22-18AWG, RND	1.000	EA
1	10	5090-0406	WASHER, LOCKING, SPLIT, NO. 6	4.000	EA
1	11	3017-0024	TERMINAL, RING, NYLON INS.	1.000	EA
1	12	9800-0955	DC FAN ASSY, AS-4	1.000	EA

Pgm BM00119R  
Time 16:55:40

MicroScan, Inc. - Instrumentation  
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Assembly Name 9800-1835  
Revision Level 502

ASM, CABLE, POWER BD/CW  
Revision Date 8/18/94 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-1835	ASSY DWG, CABLE, POWER BD/CW	1.000	RF
1	2	3013-1205	PIN, CONN, CRIMP, 24-18AWG	30.000	EA
1	3	3001-2200	WIRE, BLK, 22AWG	1.000	FT
1	4	3001-2211	WIRE, BRN, 22AWG	1.000	FT
1	5	3001-2222	WIRE, RED, 22AWG	1.000	FT
1	6	3001-2233	WIRE, ORG, 22AWG	1.000	FT
1	7	3001-2244	WIRE, YLW, 22AWG	1.000	FT
1	8	3001-2255	WIRE, GRN, 22AWG	2.000	FT
1	9	3001-2266	WIRE, BLU, 22AWG	1.000	FT
1	10	3001-2277	WIRE, VIO, 22AWG	2.000	FT
1	11	3001-2288	WIRE, GRY, 22AWG	1.000	FT
1	12	3001-2299	WIRE, WHITE, 22AWG	1.000	FT
1	13	3001-2290	WIRE, WHT/BLK, 22AWG	1.000	FT
1	14	3001-1800	WIRE, BLK, 18AWG	1.000	FT
1	15	3001-1822	WIRE, RED, 18AWG	1.000	FT
1	16	4301-1201	TIES, CABLE, 6"	2.000	EA
1	17	4313-0010	MARKER, CABLE TIE	1.000	EA
1	18	3011-1502	CONN, HOUSING PLUG	2.000	EA



Pgm BM00119R  
Time 16:55:47

MicroScan, Inc. - Instrumentation  
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Assembly Name 9800-1837  
Revision Level 502

ASSY,CABLE,A/D-PHOTO BOARD  
Revision Date 9/01/94 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-1837	ASSY DWG,CABLE,A/D-PHOTO BOARD	1.000	RF
1	2	3002-2261	CABLE,FLAT,28AWG,26-COND	1.000	FT
1	3	3008-0261	CONN,F,26 PIN	2.000	EA

gm BM00119R  
Time 16:55:53

MicroScan, Inc. - Instrumentation  
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Assembly Name 9800-2386  
Revision Level 504

ASSY,CABLE ,A/D INTERFACE,AS4  
Revision Date 9/30/98 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-2386	ASSY DWG, CABLE,A/D INTER AS4	1.000	RF
1	2	3015-2628	CONN,F,26 PIN, NON-POLARIZING	1.000	EA
1	3	3008-0141	CONN,14 PIN,RIBBON	1.000	EA
1	4	3008-0503	CONN,CARD-EDGE, 50-COND	1.000	EA
1	5	3008-0502	CONN,F,50-COND	1.000	EA
1	6	9010-1255	MPI,CABLE, A/D INTER, SHLD,AS4	1.000	RF
1	7	3002-5076	CABLE,RND,SHLD/JKT,FLAT,64 CON	2.000	FT
1	8	3001-1854	WIRE,GRN/YEL,18AWG	.500	FT
1	9	3025-0618	TERMINAL,LUG,INS,22-18AWG,RND	1.000	EA
1	10	4311-3200	TUBING,HEAT SHRINK,FLEX,1/2"	.166	FT
1	11	8100-2102	LABEL,CABLE,1.00" X 2.25"	1.000	EA
1	12	3015-2636	STRAIN RELEIF,CONN,50 PIN	1.000	EA

Pgm BM00119R  
Time 16:55:59

MicroScan, Inc. - Instrumentation  
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Assembly Name 9800-2399  
Revision Level 504

ASSY,CABLE,PHOTO BRD,AS/4  
Revision Date 11/13/96 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-2399	ASSY DWG,CABLE,PHOTO BRD,AS/4	1.000	RF
1	2	3002-5075	CABLE,SHIELDED,28AWG,26-COND	1.500	FT
1	3	3008-0261	CONN,F,26 PIN	2.000	EA
1	4	3001-1854	WIRE,GRN/YEL,18AWG	.500	FT
1	5	3025-0618	TERMINAL,LUG,INS,22-18AWG,RND	1.000	EA
1	6	8100-2103	LABEL,CABLE,1.00" X 3.75"	1.000	EA

Pgm BM00119R  
Time 16:56:05

MicroScan, Inc. - Instrumentation  
Bill Of Materials In Bubble # Sequence  
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Assembly Name 9800-2431  
Revision Level 502

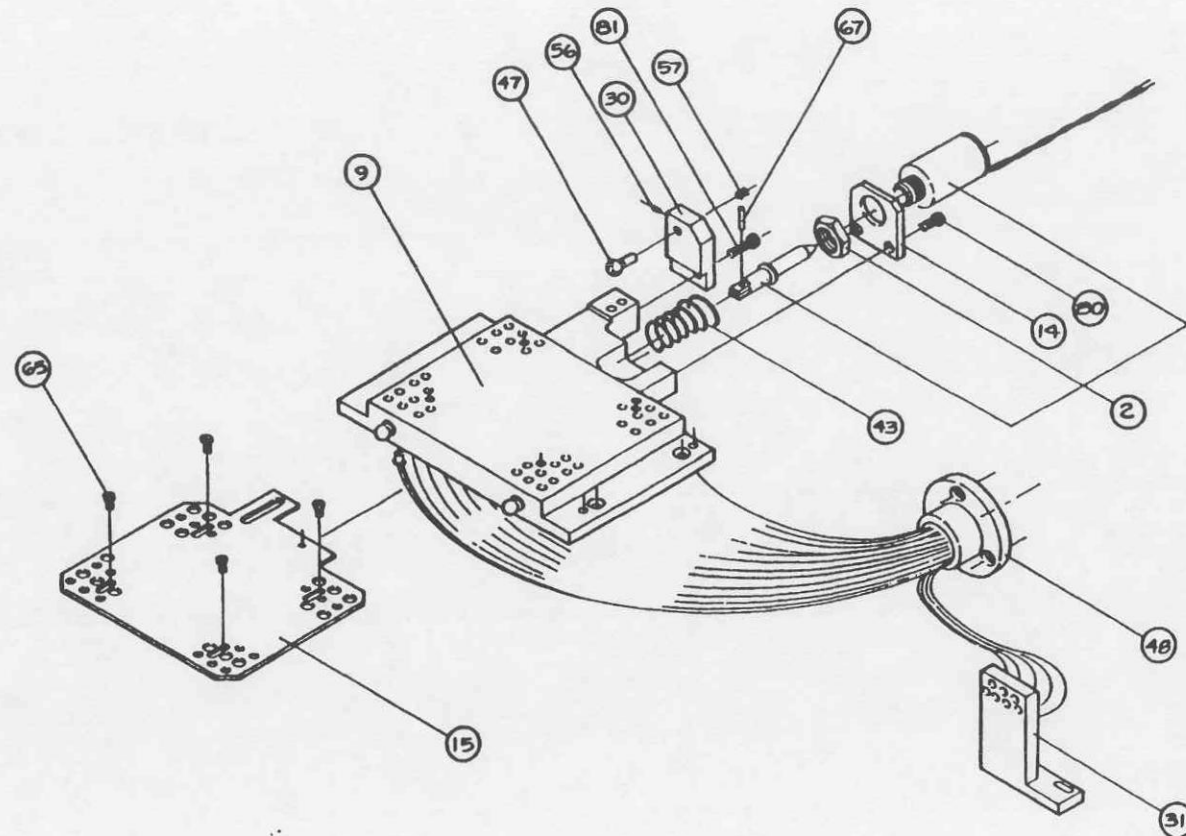
ASSY,BRACKET,CPU A/D,AS-4  
Revision Date 1/21/99 Number of Levels Exploded 1

Level	Bubble #	Component	Component Description	Required Quantity	U/M
-----	-----	-----	-----	-----	---
1	1	9900-2431	ASSY DWG,BRKT,CPU A/D,AS-4	1.000	RF
1	2	4100-0400	CARD GUIDE, 6.5"	4.000	EA
1	3	3015-2156	CONN,EDGEBOARD 56 CONTACT	1.000	EA
1	4	5534-0006	COVER,CPU BOARD, AS-4	1.000	EA
1	5	5028-0022	SCR,BHCS,4-40 X 3/8	2.000	EA





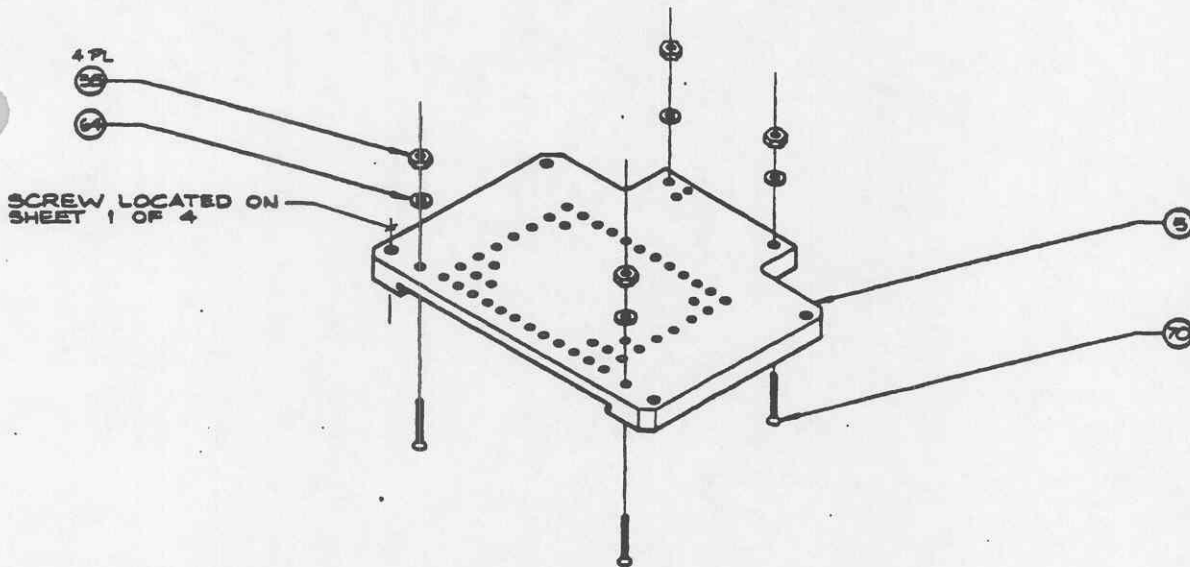
REVISED		DATE	APPROVED
REF SHT 1		~	~



DETAIL A

REV	QTY	DATE	REVISED BY	APPROVED BY	REASON FOR CHANGE
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			DADE Dade MicroScan Inc. West Sacramento, CA 95691 USA		
FINISH	QTY	DATE	REVISED BY	APPROVED BY	REASON FOR CHANGE
N/A	1	11-12-95	BGM		DRAWER/OPTICS ASSY
N/A	1				
N/A	1				
DO NOT SCALE DRAWING			SCALE	DATE	REV
				9900-0132	H
				SHEET 2 OF 5	

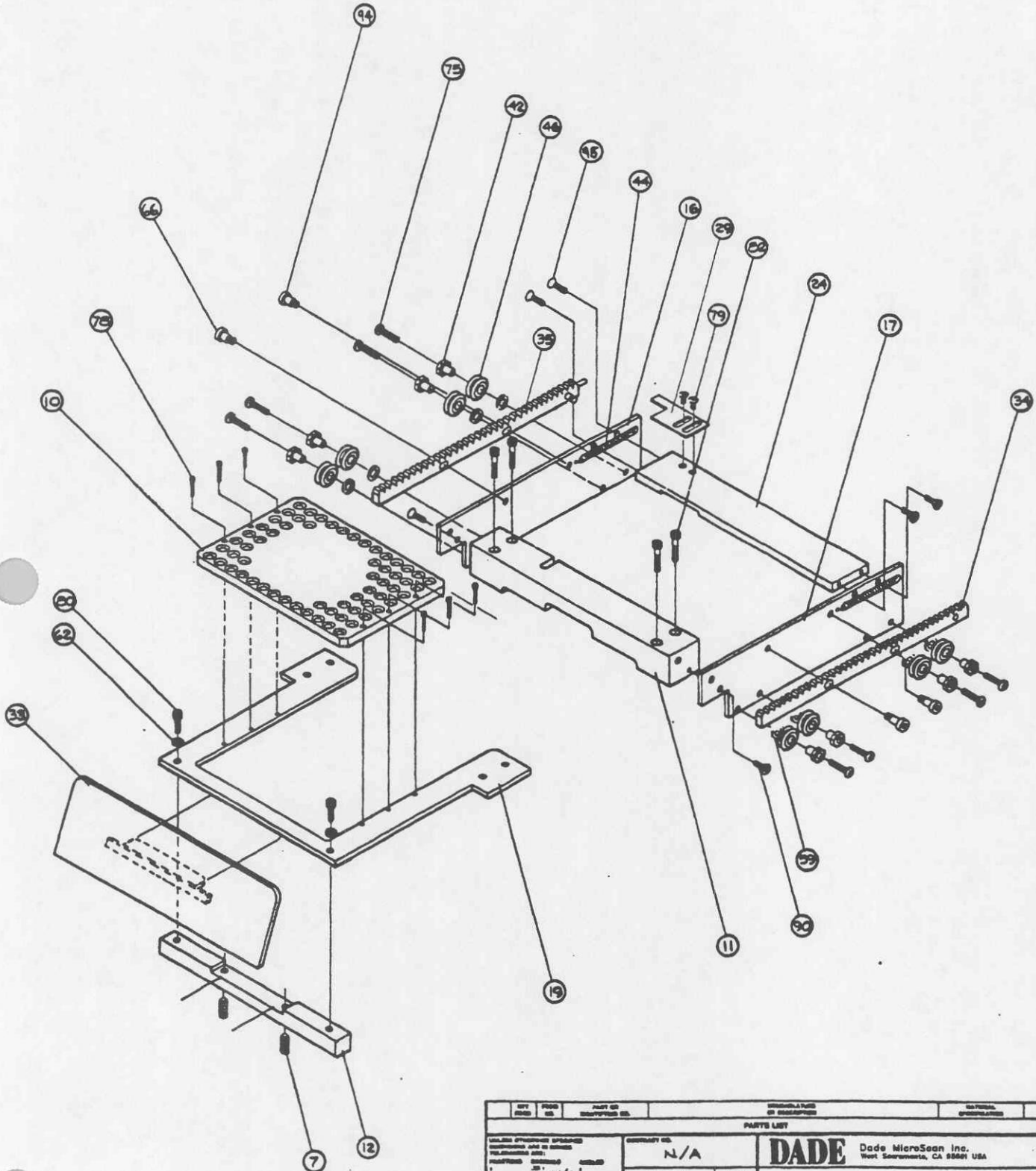
REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
		REF SHT 1	



DETAIL 13

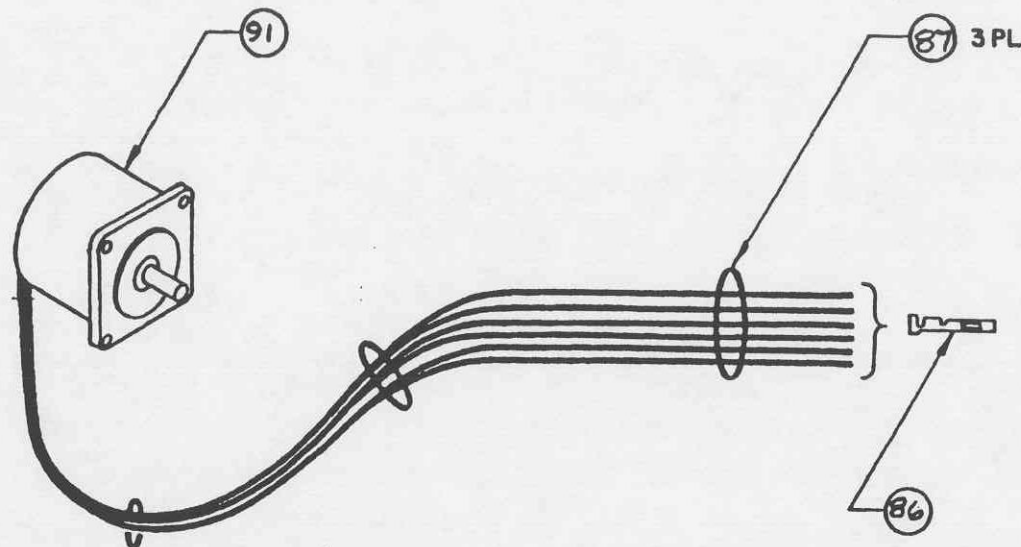
OFF READ	FILE NO.	PLAT NO.	DESCRIPTION OR IDENTIFIER	CONTRACT OR IDENTIFIER	REVISION OR IDENTIFIER
PARTS LIST					
ORDER SPECIFICATIONS DIMENSIONS AND TOLERANCES FINISHES AND MATERIALS N/A		CONTRACT NO. N/A		<b>DADE</b> Dade MicroScan Inc. West Sacramento, CA 95691 USA	
ORDER NO. N/A		ORDER DATE BGM 11-12-89		<b>DRAWER/OPTICS ASSY</b>	
PART NO. N/A		PART NAME N/A		PART NO. 9900-0132	
DO NOT SCALE DRAWING		SCALE ~		SHEET 3 OF 5	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		REF SHT 1		



REV	FIG	PART NO	DESCRIPTION	DATE	APPROVED								
1	1	9900-0132	DRAWER/OPTICS ASSY	11-12-89	BGM								
<table border="1"> <tr> <td>DADE</td> <td>Dade MicroScan Inc.</td> </tr> <tr> <td colspan="2">West Sacramento, CA 95601 USA</td> </tr> </table>						DADE	Dade MicroScan Inc.	West Sacramento, CA 95601 USA					
DADE	Dade MicroScan Inc.												
West Sacramento, CA 95601 USA													
<table border="1"> <tr> <td>DATE</td> <td>PAGE NO.</td> <td>REV. NO.</td> <td>REV.</td> </tr> <tr> <td>11-12-89</td> <td>1</td> <td>9900-0132</td> <td>H</td> </tr> </table>						DATE	PAGE NO.	REV. NO.	REV.	11-12-89	1	9900-0132	H
DATE	PAGE NO.	REV. NO.	REV.										
11-12-89	1	9900-0132	H										
DO NOT SCALE DRAWING													





NOTES:

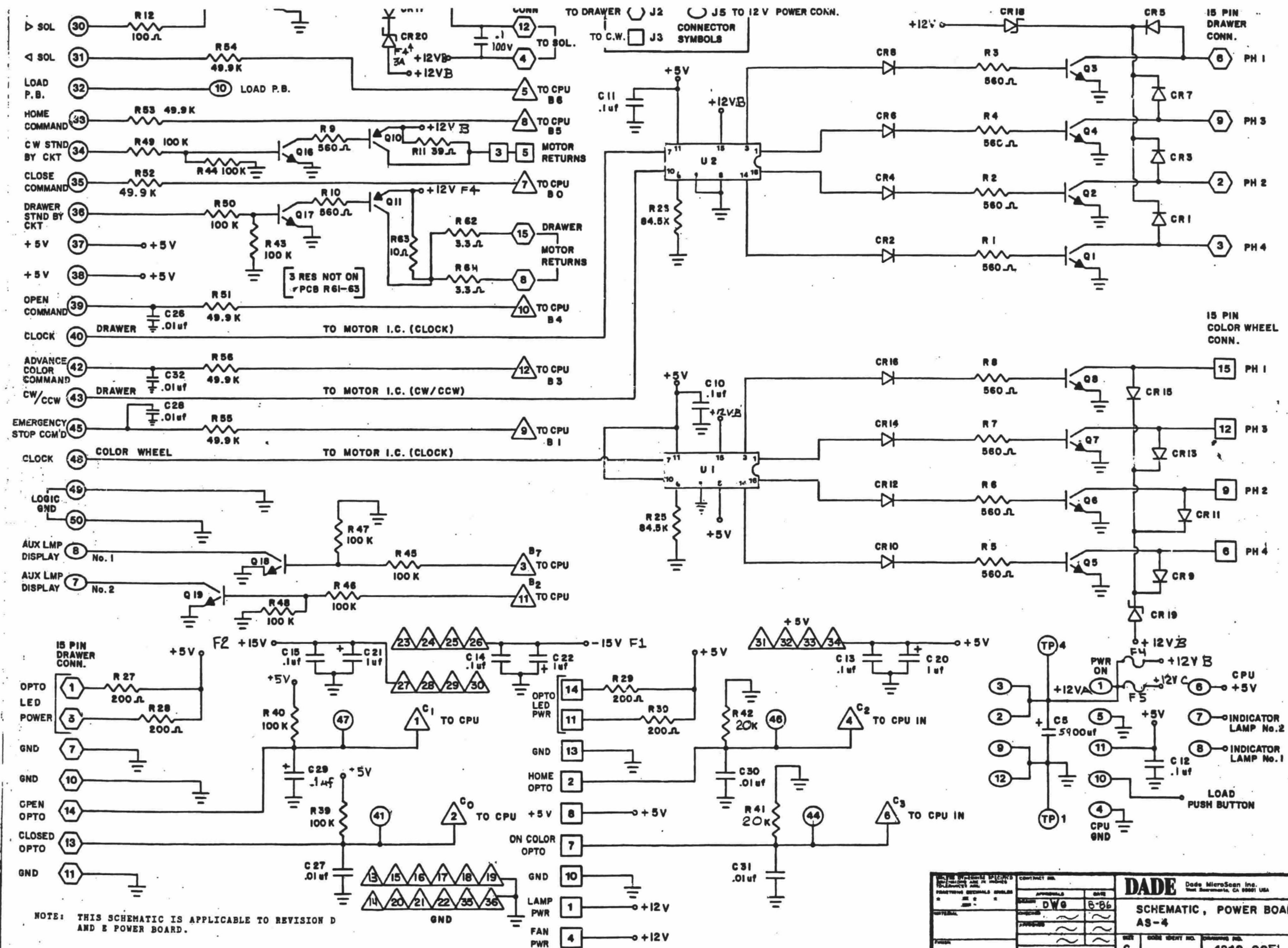
1. CUT ALL WIRES TO  $17.00 \pm .25$

SEE DETAIL

<b>DADE</b> Dade MicroSeen Inc. 1000 S. Bascom Ave. Suite 100 San Jose, CA 95128 USA	
<b>DRAWER/OPTICS ASSY</b>	
REV <b>H</b>	9900-0132
NONE	5 5



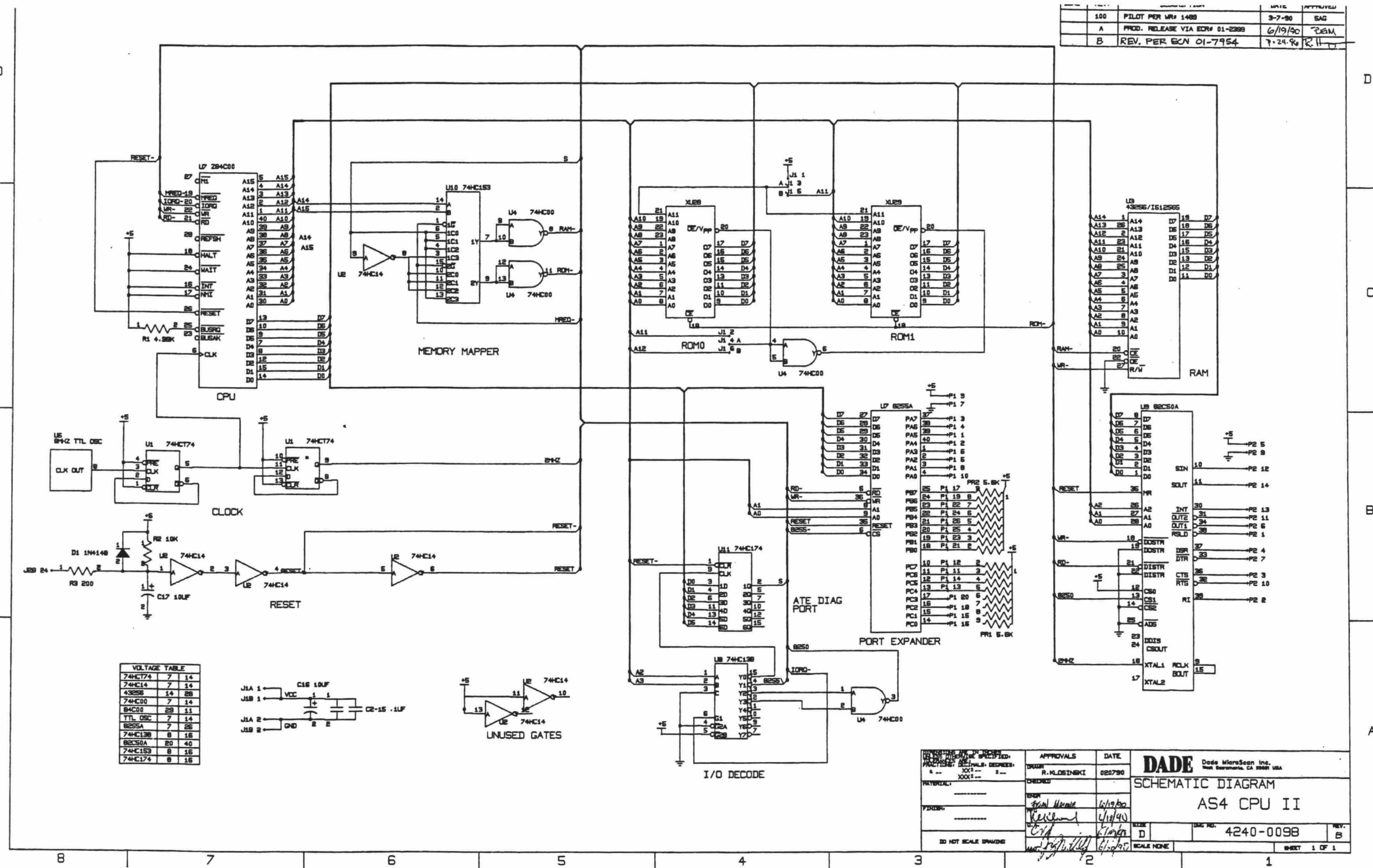




DADE		Dade MicroScan Inc.	
Schematic, Power Board, AS-4		REV 6	
4240-0051		2 of 2	
DO NOT SCALE DRAWINGS		SCALE NONE	

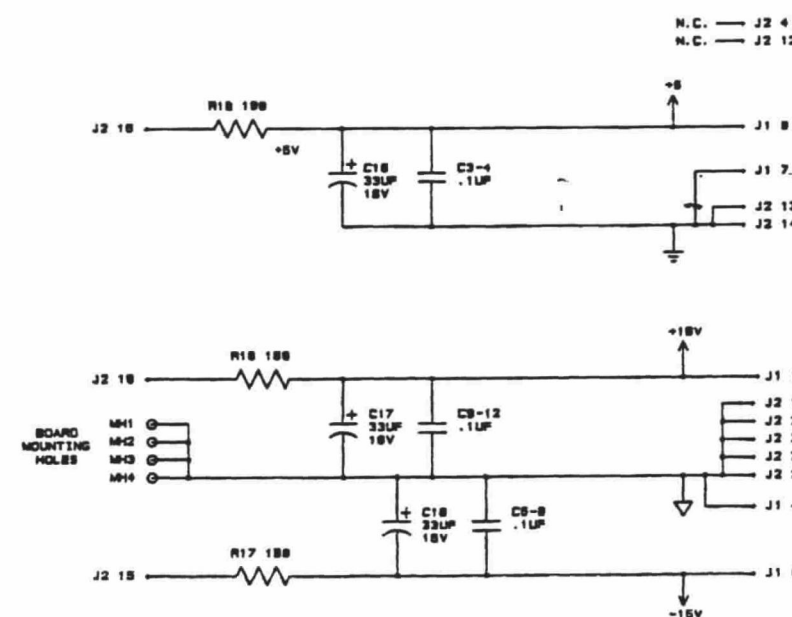
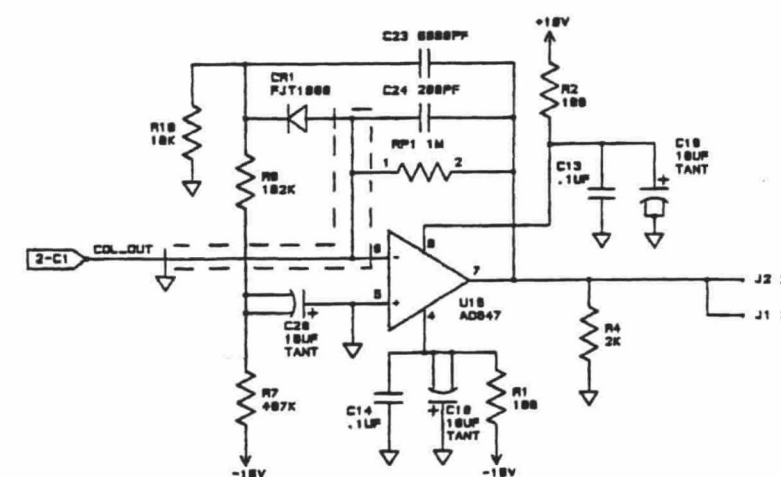
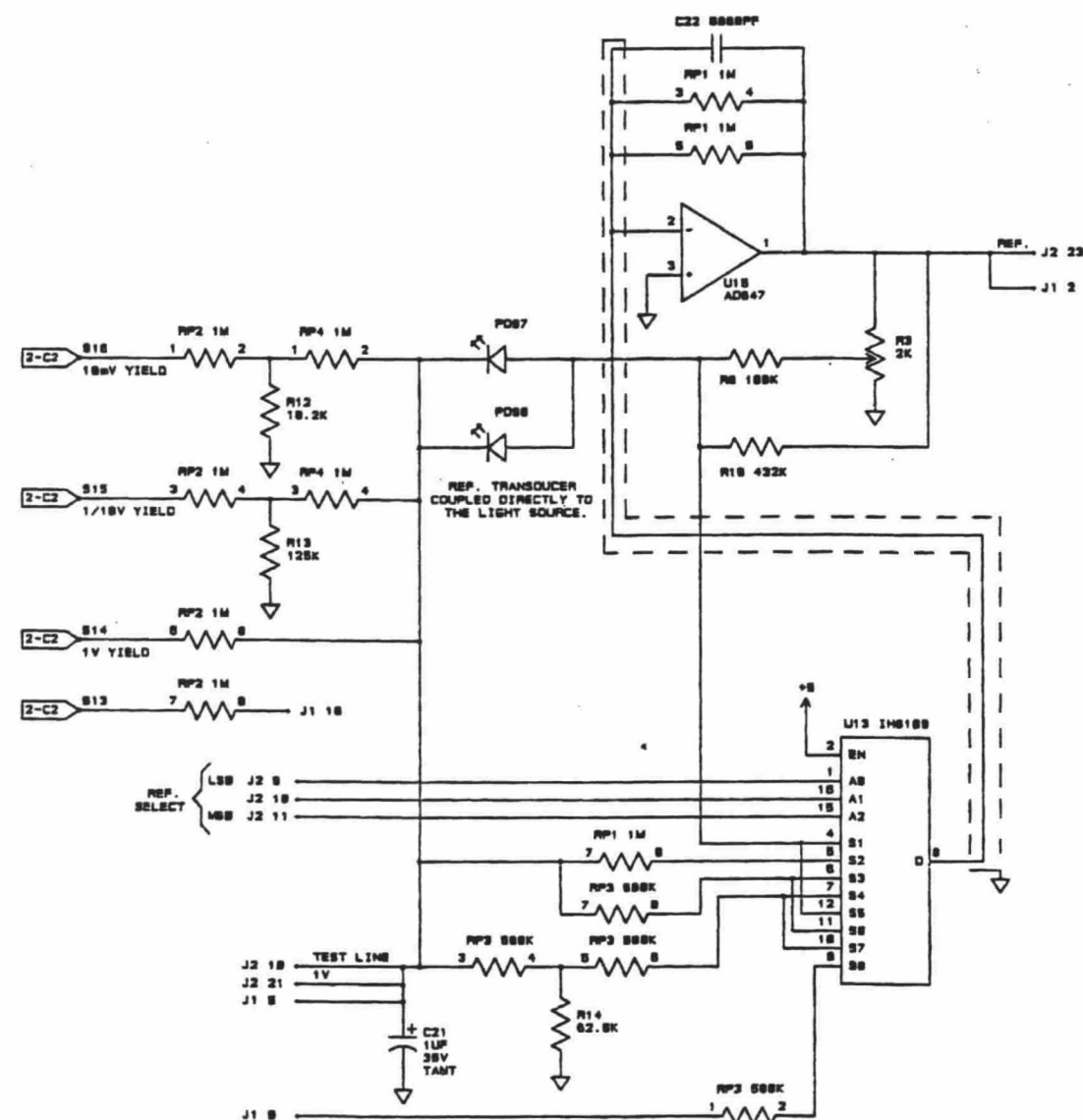


100	PILOT PER WR# 1489	DATE	3-7-90	APPROVED	SAG
A	PROD. RELEASE VIA ECR# 01-2399	6/19/90	28M		
B	REV. PER ECR# 01-7954	7-24-90	R.H.		



APPROVALS	DATE	<b>DADE</b> Dade MicroScan Inc. 1000 S. Main St., Suite 100 San Bernardino, CA 92410 USA
CHECKED	020790	
DESIGNED	6/19/90	<b>SCHEMATIC DIAGRAM</b> <b>AS4 CPU II</b>
REVIEWED	6/19/90	
DO NOT SCALE DRAWING	SCALE NONE	D 4240-0098 SHEET 1 OF 1





SYMBOL	HIGHEST	UNUSED	DESCRIPTION
R	R19	RS.8.11.18	RESISTOR
C	C24	C1, C2	CAPACITOR
U	U15		I.C.
PD	PD98		PHOTODIODE
CR	CR1		DIODE
J	J2		HEADER
RP	RP4		RESISTOR PACK

[illegible]

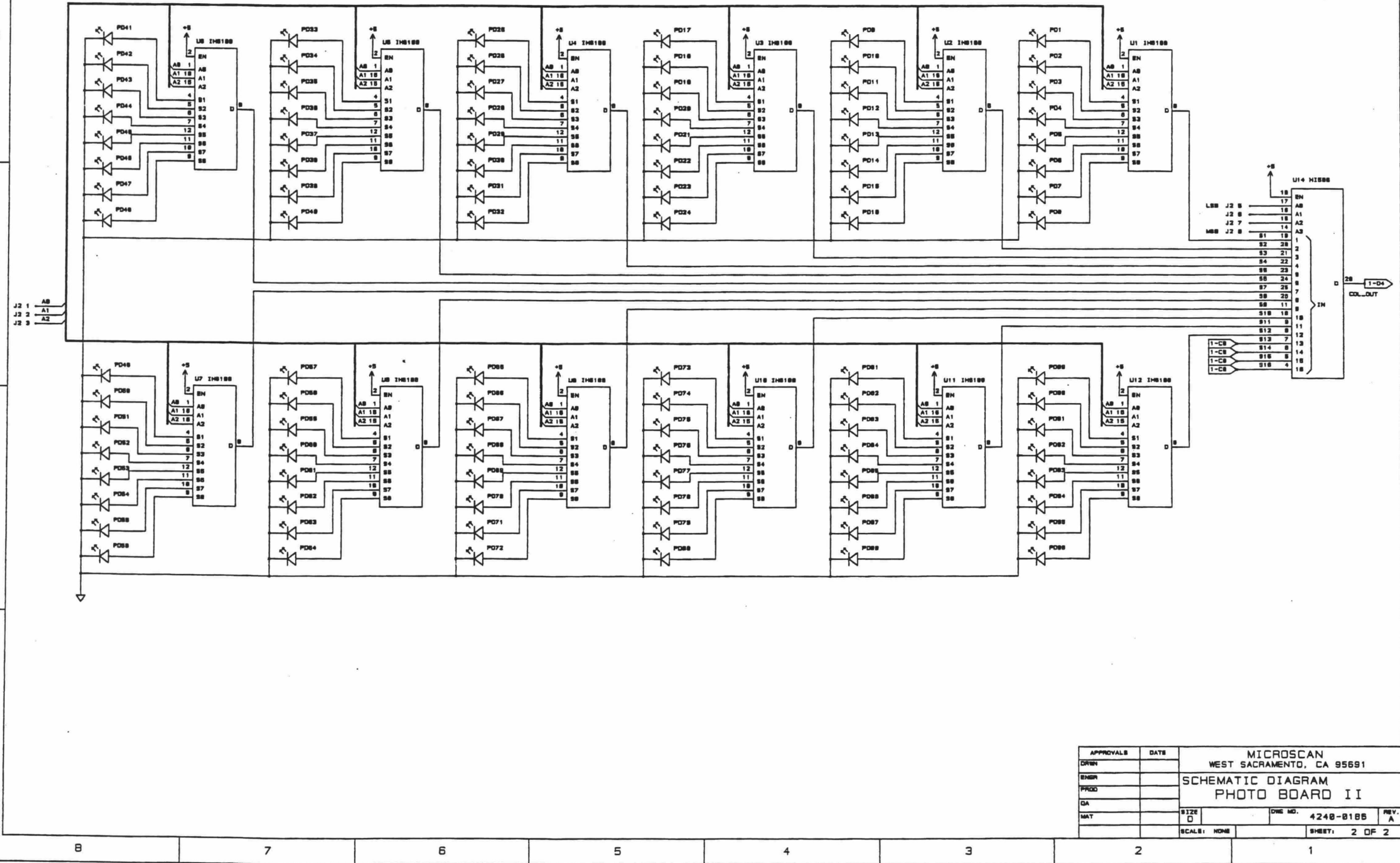
NOTES: UNLESS OTHERWISE SPECIFIED

- NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE VALUES ARE MEASURED IN OHMS.
  2. ALL CAPACITANCE VALUES ARE MEASURED IN MICRO FARADS.
  3. - - - INDICATES GUARD RING AROUND TRACE.

APPROVALS		DATE		MICROSCAN	
DRIN	W Robinson	11/18/85	WEST SACRAMENTO, CA 95881		
ENGR	<i>[Signature]</i>	11/22/85	SCHEMATIC DIAGRAM PHOTO BOARD I I		
PROD	<i>[Signature]</i>	11/22/85			
QA	<i>[Signature]</i>	11/22/85			
<i>[Signature]</i>	<i>[Signature]</i>	11/22/85			
SIZE	0		DWG NO.	4248-0188	
SCALE	NONE		SHEET	1 OF 2	



ZONE	REV	DESCRIPTION	DATE	APPROV
1		SEE SHEET 1		



8

7

6

5

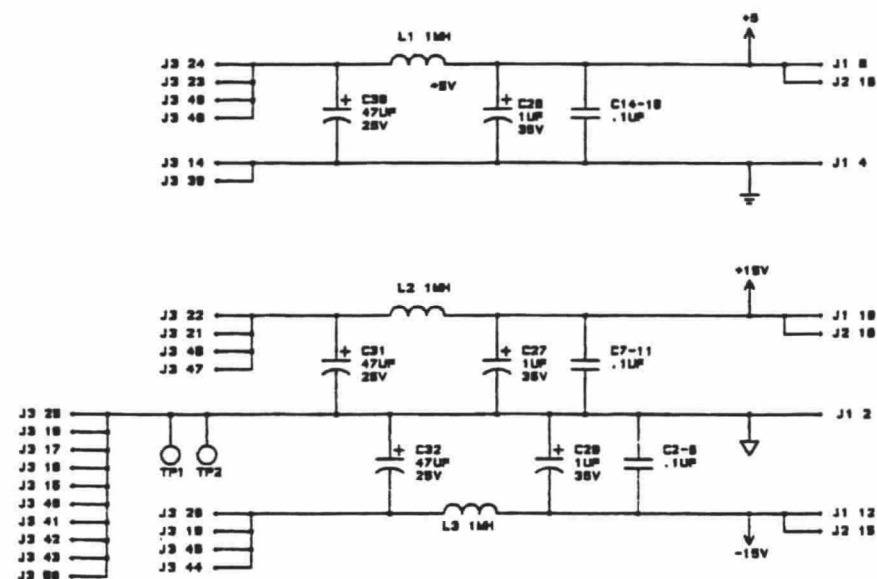
4

3

2

1

ZONE	REV	DESCRIPTION	DATE	APPROV
00	00	DESIGN RELEASE WR-5388		
100	00	PILOT RELEASE PER WR-5582	10/88/88	S DOHERMANN
A	01	REV PER ECH 81-8821	5/5/87	Lockhart



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTANCE VALUES ARE MEASURED IN OHMS.
2. ALL CAPACITANCE VALUES ARE MEASURED IN MICRO FARADS.

REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
R	R36	---	RESISTOR
C	C37	C13	CAPACITOR
U	U11	U1	I.C.
J	J3	---	HEADER
CR	CR2	---	DIODE
L	L3	---	INDUCTOR
TP	TP2	---	TEST POINT

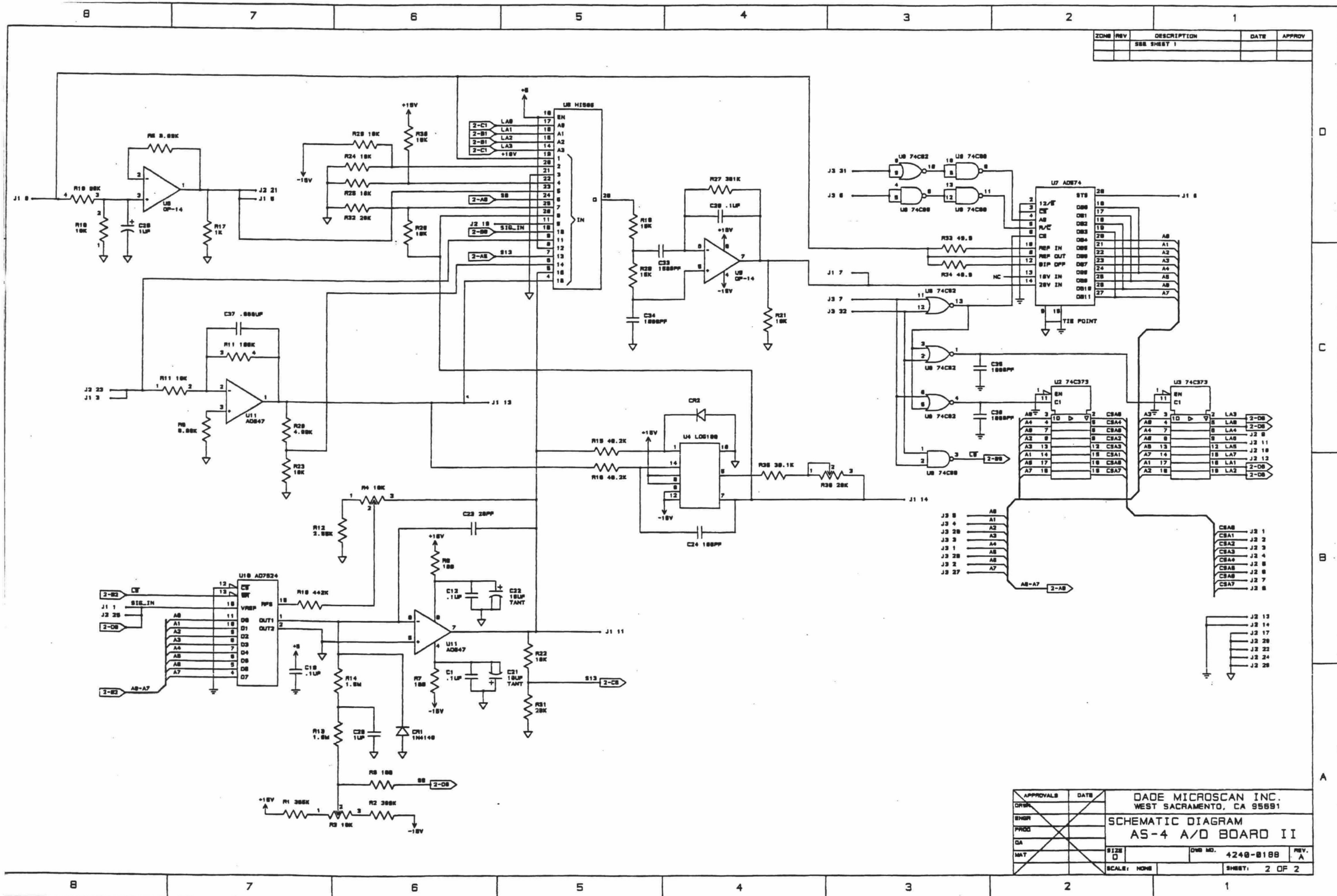
STANDARD VOLTAGE TABLE						
DEVICE	REF. DES.	+5V	0V	+15V	AGND	-15V
H1506	U6	18	12	1		27
74C373	U2, U3	28	18			
74C00	U9	14	7			
74C02	U8	14	7			
AD7524	U10	14			3	

APPROVALS		DATE	DADE MICROSCAN INC.	
DRIN	P MENICE	10/81/88	WEST SACRAMENTO, CA 95831	
ENGR	S DOHERMANN	10/88/88	SCHEMATIC DIAGRAM	
PROD	S DOHERMANN	10/88/88	AS-4 A/D BOARD II	
QA	R CORTERO	10/81/88	SIZE	DWG NO. 4248-0188
MAT	C LOCKHART	10/10/88	SCALE: NONE	REV. A
			SHEET: 1 OF 2	

4248-0188

DATE FILED: 10/10/88

DWG



**4240-0188**

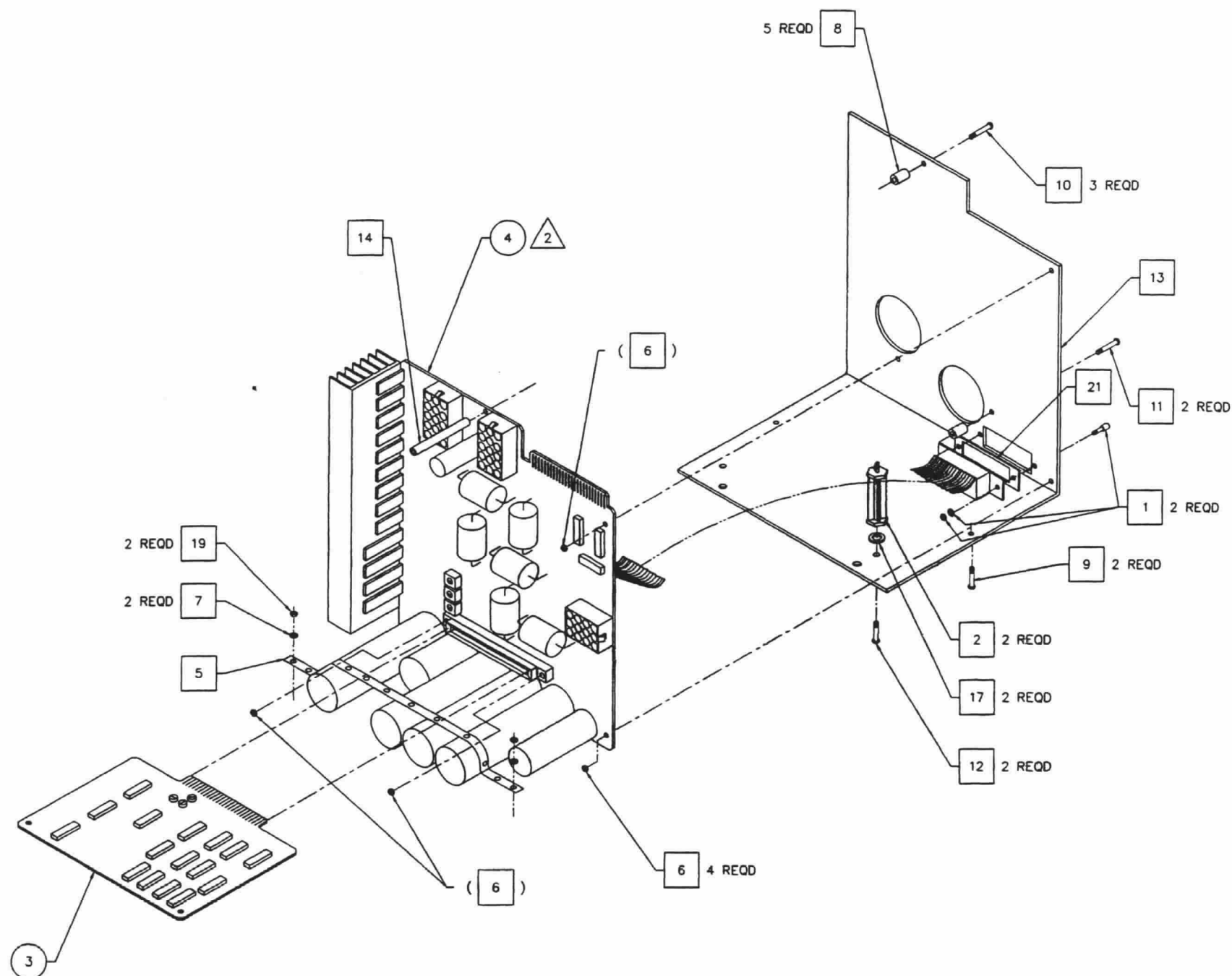
\_\_\_\_\_

NOTES: UNLESS OTHERWISE SPECIFIED.

1. USE PARTS LIST 9700-0259 WHEN "□" APPEARS AROUND ITEM.  
USE PARTS LIST 9800-0259 WHEN "○" APPEARS AROUND ITEM.

2. SOME COMPONENTS ARE NOT SHOWN FOR CLARITY (ITEM 4). FOR DETAILED INFORMATION SEE MICROSCAN PART NUMBER 4230-0051 AT CURRENT REVISION LEVEL.

3. STORAGE CONDITION: PROTECT FROM ELECTROSTATIC DISCHARGE.



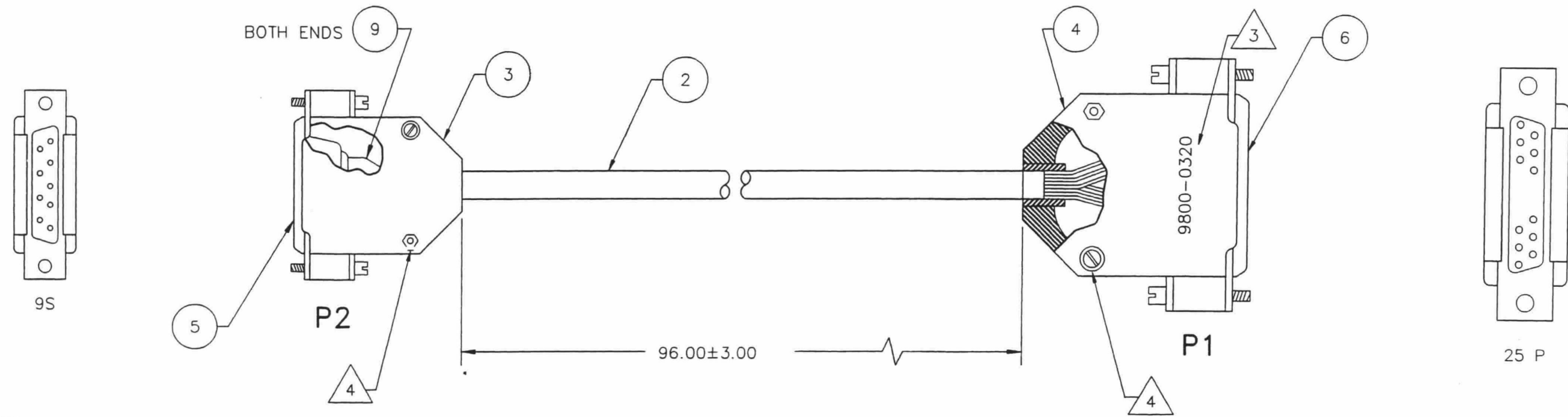
INCHES				IMP.	REV.	ECN/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:					C	01-1514	M Cherniski	03/10/89	DRAWN B Malone	08/86
FRACTIONS					D	01-2338	B Masterson	06/20/90	CHECK P Duran	08/13/97
DECIMALS					E	01-5027	D McManus	01/17/93	ENGR J Maceman	09/10/86
ANGLES					F	01-6409	D Teeter	03/03/94	PROD	
± .XX ±					G	01-7549	R Haugen	02/06/96	QA	
± .XXX ±					LSL	H 01-7954	R Haugen	07/24/96	MAT S Acosta	09/86
DO NOT SCALE DRAWING					RJ	J 01-8764	R Haugen	08/19/97	ACCT	
MATERIAL					REG. (CURRENT REV.)		C Dryer	08/19/97	REDRAWN G Singh	02/04/94
FINISH										

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

ASSY DWG, POWER  
CONTROLLER BOARD, UL UPPR.

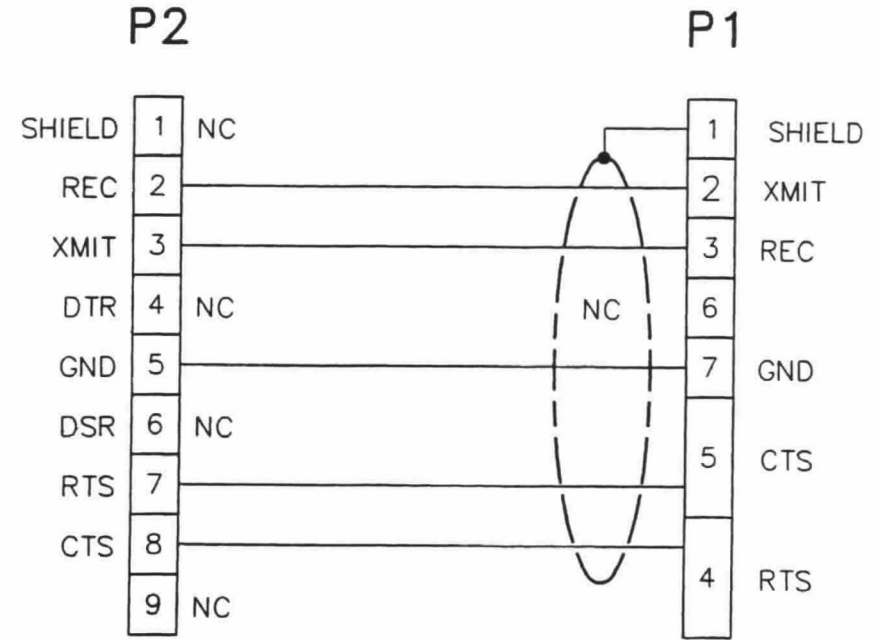
SIZE DWG. NO. 9900-0259 REV J  
SCALE NONE DWG. FILE TYPE 9900-02258 AutoCAD SHEET 1 OF 1

8 7 6 5 4 3 2 1



NOTES: UNLESS OTHERWISE SPECIFIED

- 1. USE PARTS LIST NO. 9800-0320.
- 2. PROCESS ENDS OF WIRE ACCORDING TO SPECIFICATIONS OF TERMINAL MANUFACTURER.
- 3. MARK WITH MICROSCAN PART NUMBER IN LOCATION SHOWN.
- 4. ORIENTATION SHOWN OF FASTENING HARDWARE IS FOR ILLUSTRATION PURPOSES ONLY.
- 5. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.
- 6. PIN TO PIN CONTINUITY TEST REQUIRED.



6	③	BRN	24	97.00	P1-5	⑥	②	P2-7	⑤	②	CTS
5	③	GRN	24	97.00	P1-4	⑥	②	P2-8	⑤	②	RTS
NOTE: DCE TO DCE											
4	③	BLK	24	97.00	P1-7	⑥	②	P2-5	⑤	②	GND
	③	RED			P1-3	⑥	②	P2-3	⑤	②	TRD
2	③	WHT			P1-2	⑥	②	P2-2	⑤	②	RCD
1	③	SHLD	24	97.00	P1-1	⑥	—	N/C	—	②	SHIELD
LEAD #	WIRE ITEM #	COLOR	GAGE SIZE	LENGTH (IN)	FROM	TERM W/ ITEM #	PROC END	TO	TERM W/ ITEM #	PROC END	SIGNAL NAME

INCHES		IMP.	REV.	ECO/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .001 ± .001 ± .001 DO NOT SCALE DRAWING		A	1-368	L Stagg	01/10/87	01/10/87	Marry Jo H	12/01/86
		B	1-0584	K Howard	09/14/87	09/14/87	E Silva	12/12/97
		C	01-1559	M Cherniski	03/10/89	03/10/89	H Maleknia	12/12/86
		D	01-3854	H Maleknia	07/23	07/23	C VanPelt	12/15/86
		E	01-6250	D S Carr	12/14/93	12/14/93	S Asocsta	12/16/86
		PLD	F 01-8208	R Haugen	01/07/97	01/07/97	N/A	N/A
		RJ	G 01-8764	R Haugen	08/19/97	08/19/97	N/A	N/A
		PLD	H 01-9513	C Her	01/22/99	01/22/99	N/A	N/A
		CHD (CURRENT REV.)	R Haugen	01/22/99	01/22/99	01/22/99	G Singh	12/09/93
		REQ. (CURRENT REV.)	C Her	01/22/99	01/22/99	01/22/99		

**DADE BEHRING**  
Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

CABLE, SERIAL PORT  
9 SOCKET, 25 PIN

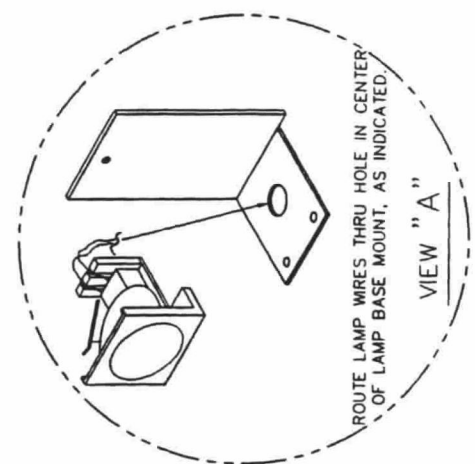
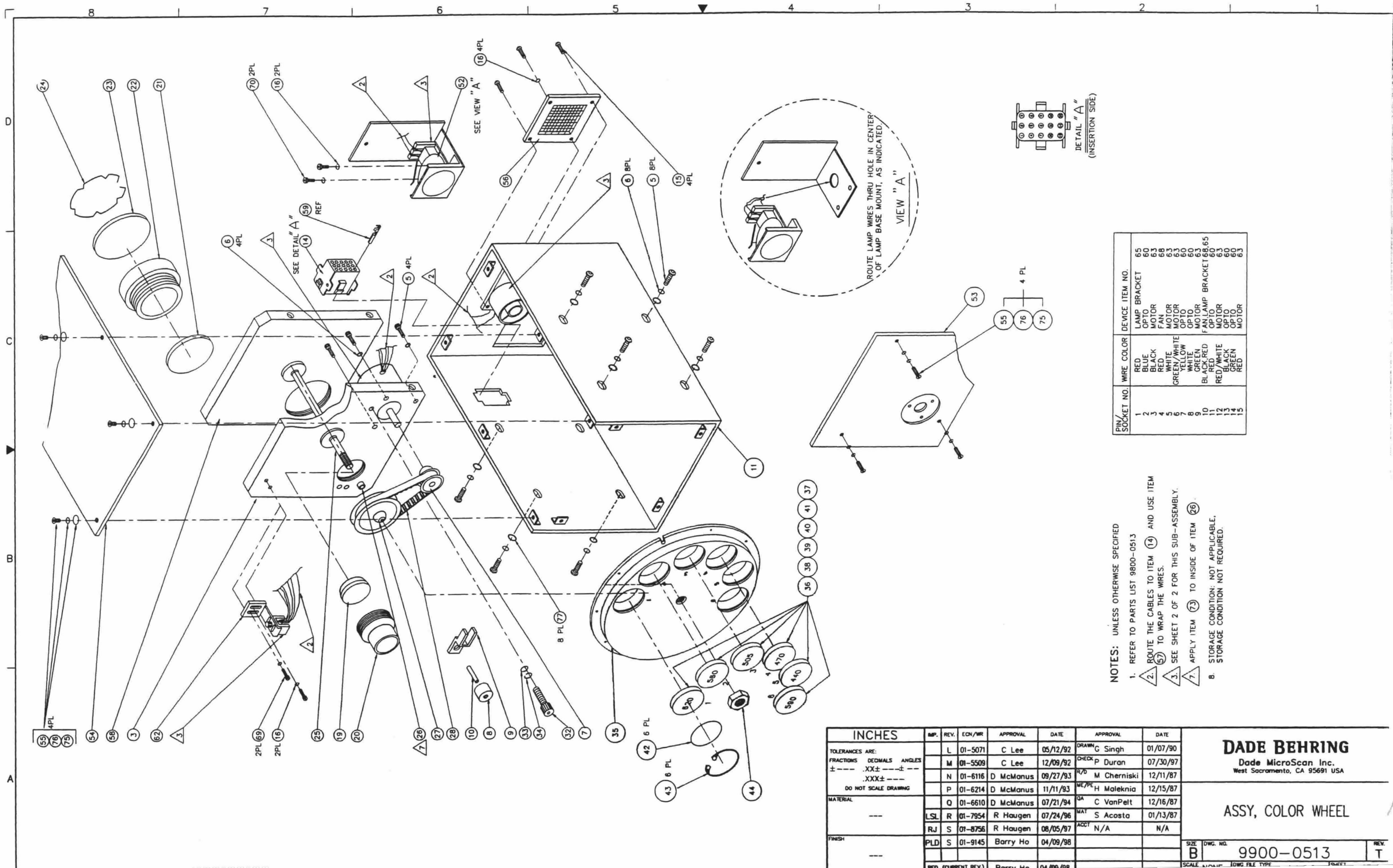
SIZE	DWG. NO.	REV.
B	9900-0320	H
SCALE	NONE	DWG FILE TYPE 9909-02250
AutoCAD		SHEET 1 OF 3



D

- C

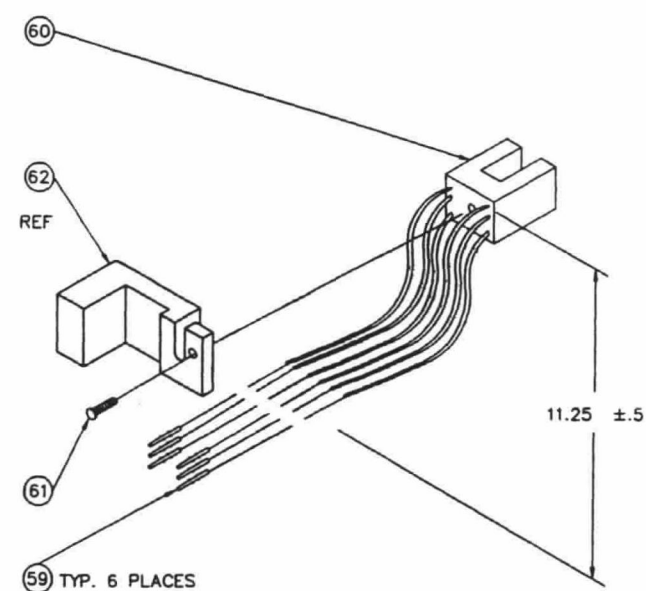
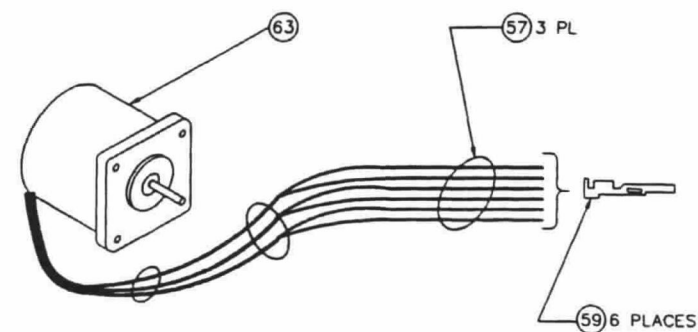
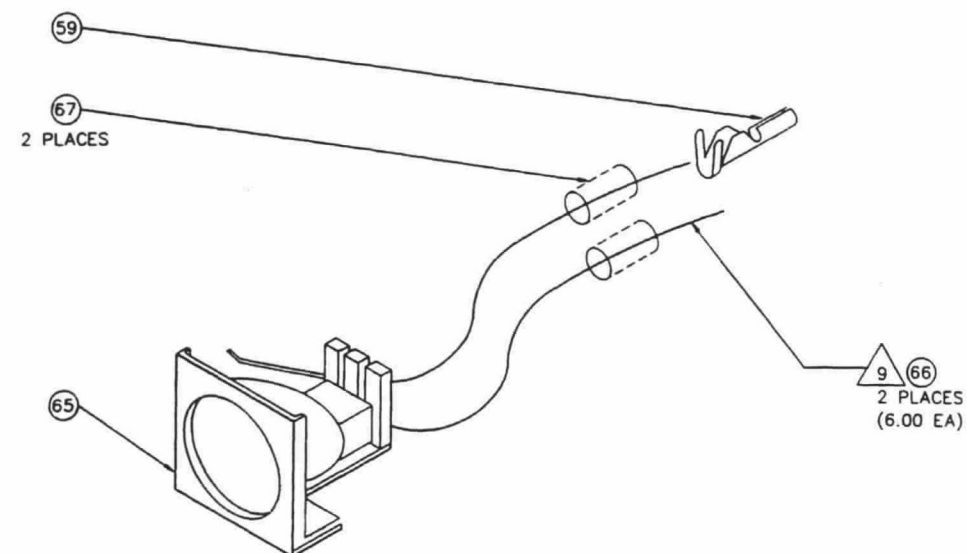
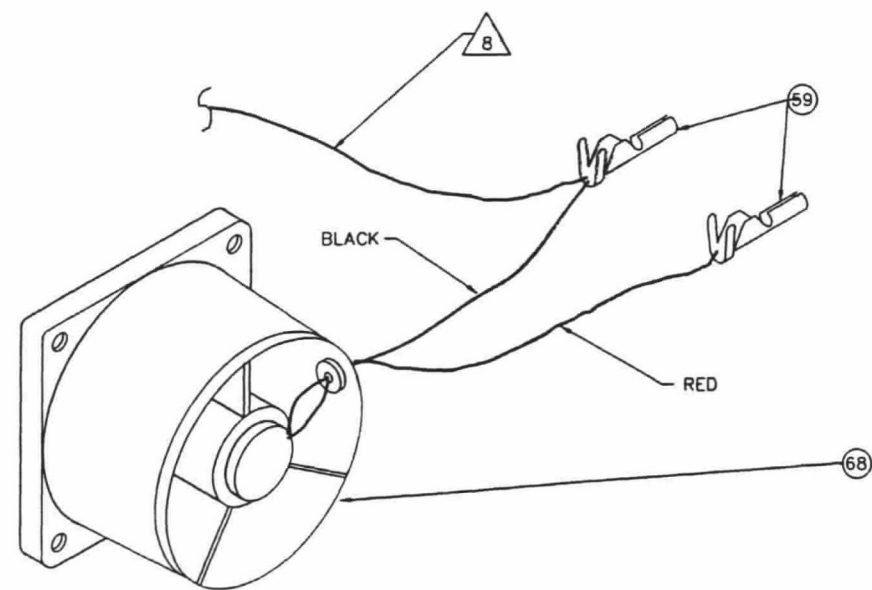
A



PIN/SOCKET NO.	WIRE COLOR	DEVICE ITEM NO.
1	RED	LAMP BRACKET 65
2	BLUE	OPTO 60
3	BLACK	MOTOR 63
4	RED	FAN 68
5	WHITE	MOTOR 63
6	GREEN/WHITE	OPTO 60
7	YELLOW	OPTO 60
8	WHITE	OPTO 60
9	GREEN	MOTOR 63
10	BLACK/RED	FAN 68
11	RED	LAMP BRACKET 65
12	RED/WHITE	OPTO 60
13	BLACK	OPTO 60
14	GREEN	OPTO 60
15	RED	MOTOR 63

INCHES				IMP.	REV.	ECN/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:										
FRACTIONS										
DECIMALS										
ANGLES										
XXX±										
DO NOT SCALE DRAWING										
MATERIAL										
---										
FINISH										
---										
RED (CURRENT REV.)										

DADE BEHRING	DADE MICROSCAN INC.	WEST SACRAMENTO, CA 95691 USA
ASSY, COLOR WHEEL	9900-0513	T



NOTES: UNLESS OTHERWISE SPECIFIED.

4. PROCESS ON END OF LEADS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

6. DIMENSION REPRESENTS EXTENDED LENGTH OF LEADS.

8. ATTACH "BLK" FAN LEAD AND ONE OF THE LAMP SOCKET LEADS TO THE SAME PIN SOCKET, ITEM 59.

9. ADD APPROXIMATELY 6.00 EA. OF ITEM 66 TO THE END OF LAMP SOCKET LEAD WITH ITEM 67 SUCH THAT THE OVERALL LENGTH IS APPROXIMATELY 9.00 TO 10.00, THEN ATTACH ITEM 59 TO THE END OF THE EXPANDED LEADS.

**DADE BEHRING**

Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

ASSY, COLOR WHEEL

SIZE	DWG. NO.	REV.
B	9900-0513	T
SCALE	DWG FILE TYPE	SHEET
NONE	9008-02288 AutoCAD	2 OF 2

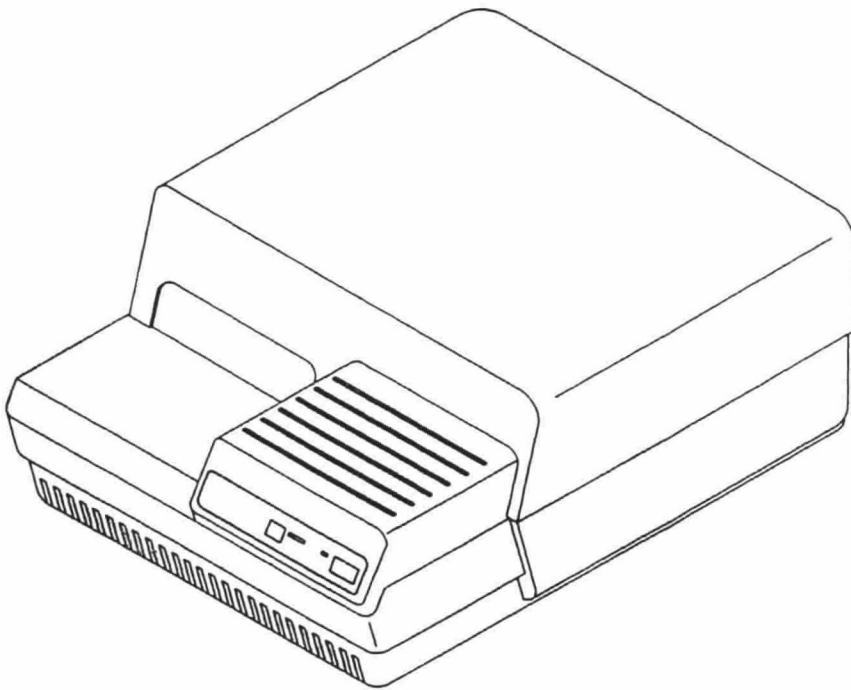
13

D

C

B

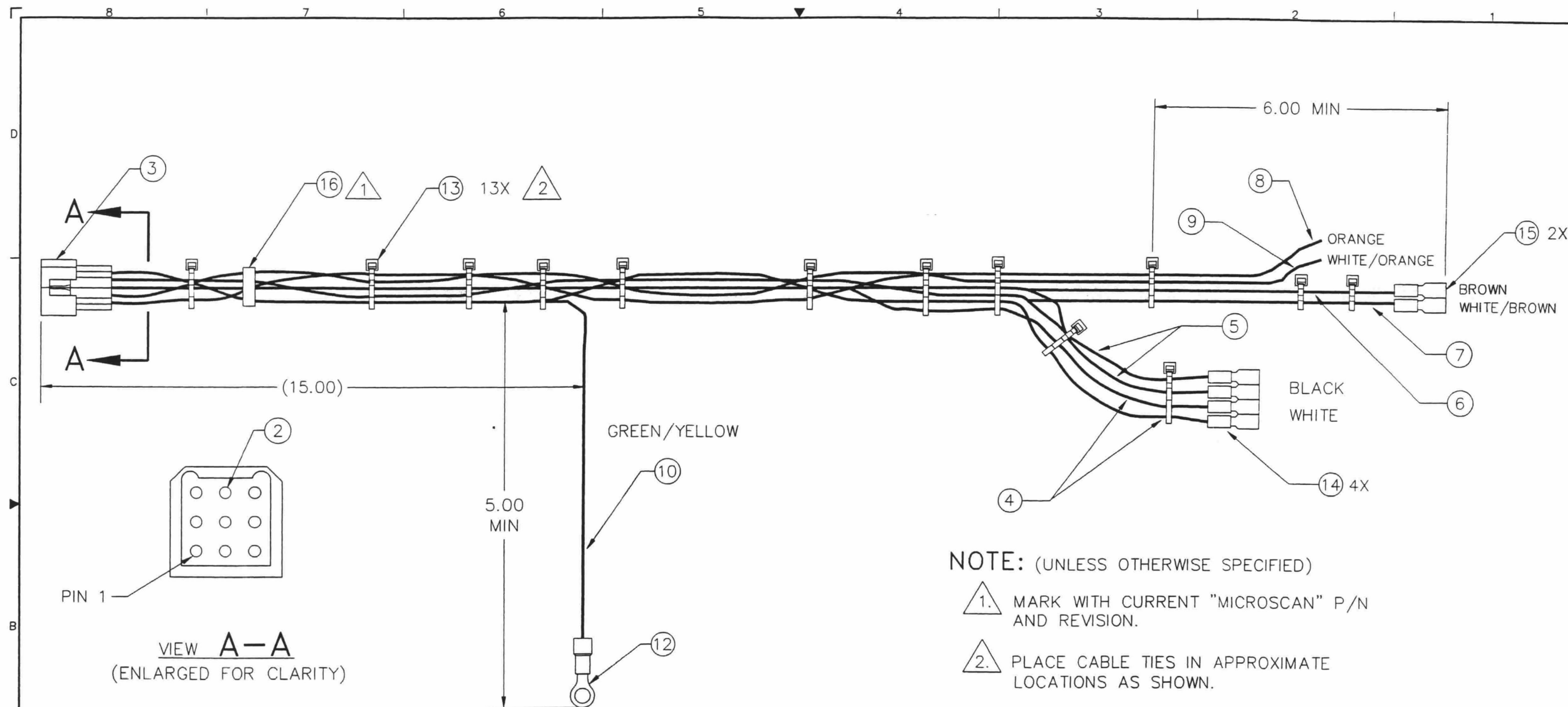
A



NOTES: (UNLESS OTHERWISE SPECIFIED)

- 1. USE PARTS LIST 9800-0701 WHEN "○" APPEARS AROUND LINE ITEM. USE PARTS LIST 9700-0701 WHEN "□" APPEARS AROUND LINE ITEM.
- 2. NOTE LOCATION OF PIN 1.
- 3. REMOVE SCREWS AND WASHERS TO ASSEMBLE COVER. USE SAME ITEMS TO SECURE COVER.
- 4. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.

INCHES		IMP.	REV.	EDR/WR	APPROVAL	DATE	APPROVAL	DATE	<div>DADE BEHRING</div> <div>Dade MicroScan Inc. West Sacramento, CA 95691 USA</div> <div>ASSY DWG, READER, AS-4</div>	
TOLERANCES AND: FRACTIONS    DECIMALS    ANGLES			E	01-7515	R Haugen	01/18/96	DRAMA P Duran	11/30/98		
± .001 ± .001 ± .001			F	01-7545	R Haugen	12/06/96	SLB K Wong	12/28/99		
DO NOT SCALE DRAWING			G	01-9610	R Haugen	02/29/96	SEL/PD McManus	09/13/94		
MATERIAL ---			H	01-7688	R Haugen	02/18/96	GA T McDowell	11/16/98		
			J	01-7698	R Haugen	07/06/96	MAT C Thompson	11/15/94		
			K	01-9084	R Haugen	01/27/98	ACCI N/A	N/A		
FINISH ---		PLD	L	01-9441	K Wong	12/28/96	SLB N/A	N/A	SIZE D DWG NO. 9900-0701 REV. M	
		PLD	M	01-9583	C Her	04/14/99	PA N/A	N/A		
		CWD (CURRENT REV.)			R Haugen	04/14/99				
		REQ. (CURRENT REV.)			P Duran	04/14/99				
		SCALE	NONE		DWG FILE TYPE 9008-02280		AutoCAD		SHEET 1 OF 8	



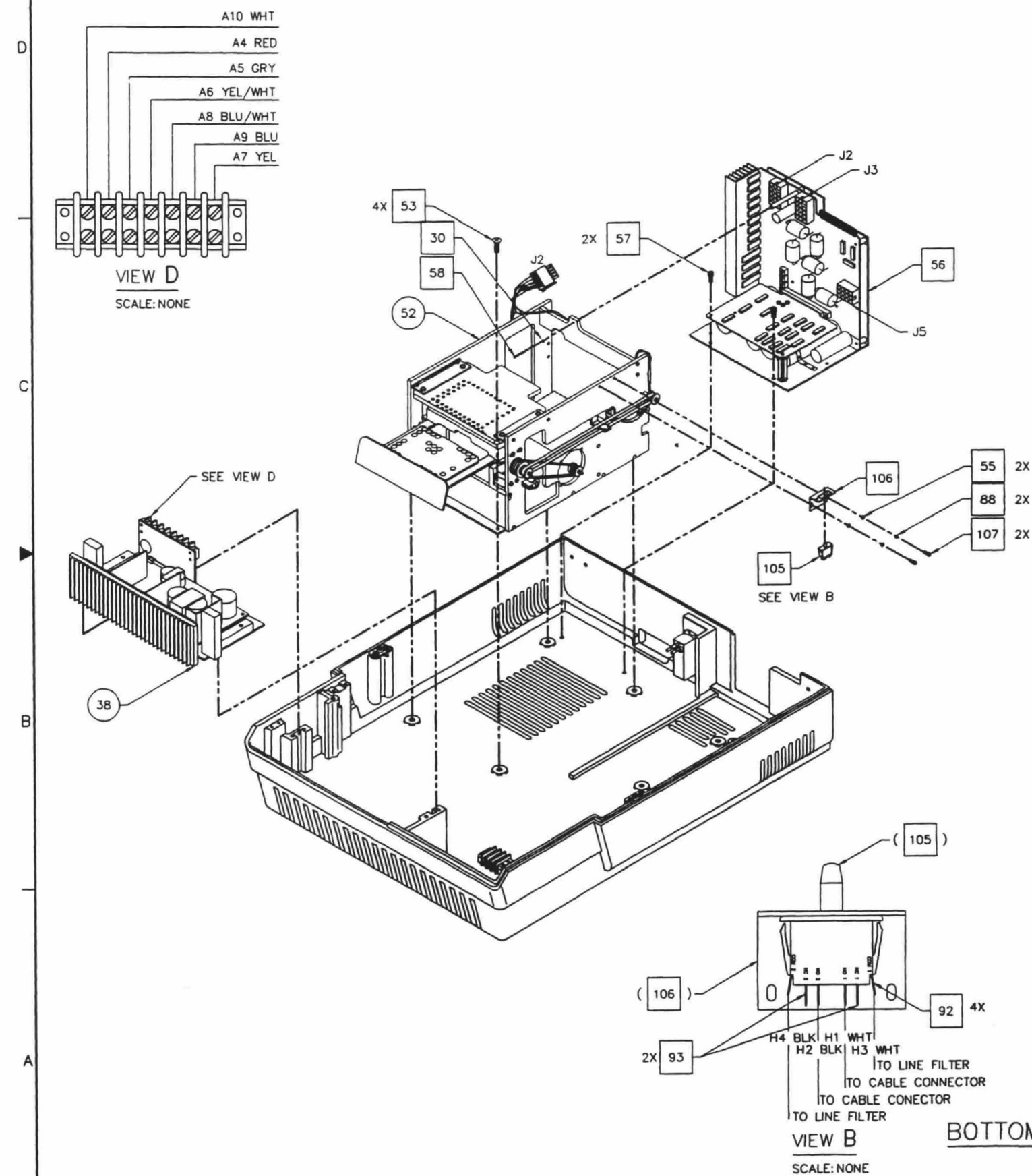
- NOTE:** (UNLESS OTHERWISE SPECIFIED)
- 1. MARK WITH CURRENT "MICROSCAN" P/N AND REVISION.
  - 2. PLACE CABLE TIES IN APPROXIMATE LOCATIONS AS SHOWN.
  - 3. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.
  - 4. PIN TO PIN CONTINUITY TEST REQUIRED.

COLOR	PIN NO.	WIRE LENGTH (TOLERANCE ±.5")
BLACK	1 —	35"
WHITE	2 —	35"
WHITE	3 —	35"
BLACK	4 —	35"
BROWN	5 —	38"
WHITE/BROWN	6 —	38"
ORANGE	7 —	35"
WHITE/ORANGE	8 —	35"
GREEN/YELLOW	9 —	20"

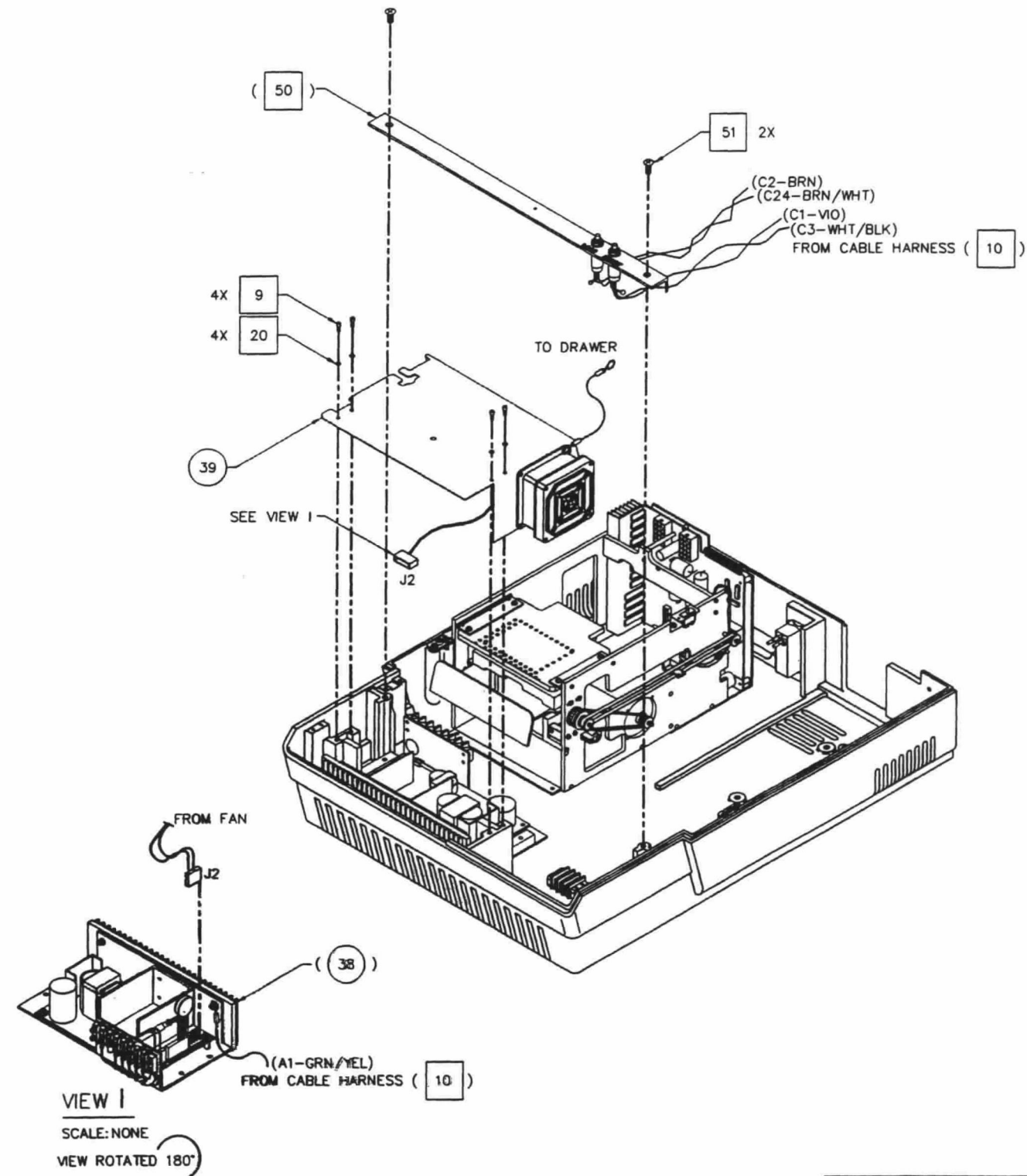
INCHES			MP.	REV.	EDN/WR	APPROVAL	DATE	APPROVAL	DATE	<div>DADE BEHRING</div> <div>Dade MicroScan Inc. West Sacramento, CA 95691 USA</div>				
TOLERANCES ARE: FRACTIONS    DECIMALS    ANGLES ± --- .XXX ± --- ± --- .XXX ± ---  DO NOT SCALE DRAWING				E	01-2332	BGM	05/30/90	DRN	SMJ				03/07/88	
				F	01-2602	SAG	08/07/90	R/D	AMC				03/09/88	
				G	01-3273	R Klosinski	03/01/91	ME/PE	CRP				03/15/88	
MATERIAL				H	01-4083	K Wong	08/29/91	QA	CVP	03/09/88	15	ASSEMBLY DRAWING, POWER HARNESS, FRONT PANEL		
				J	01-5655	D Carr	02/15/93	MAT	SA	03/11/88				
				JRB	K	01-8211	R Haugen	01/13/97	ACR	N/A				N/A
FINISH				RJ	L	01-8756	R Haugen	08/05/97	C/D	N/A				N/A
				PLD	M	01-9513	C Her	01/22/99	P/A	N/A	N/A			
				END (CURRENT REV.)		R Haugen	01/22/99							
				REV. (CURRENT REV.)		C Her	01/22/99				SIZE	DWG. NO.	REV.	
											B	9900-0519	M	
											SCALE	NONE	DWG FILE TYPE	SHEET



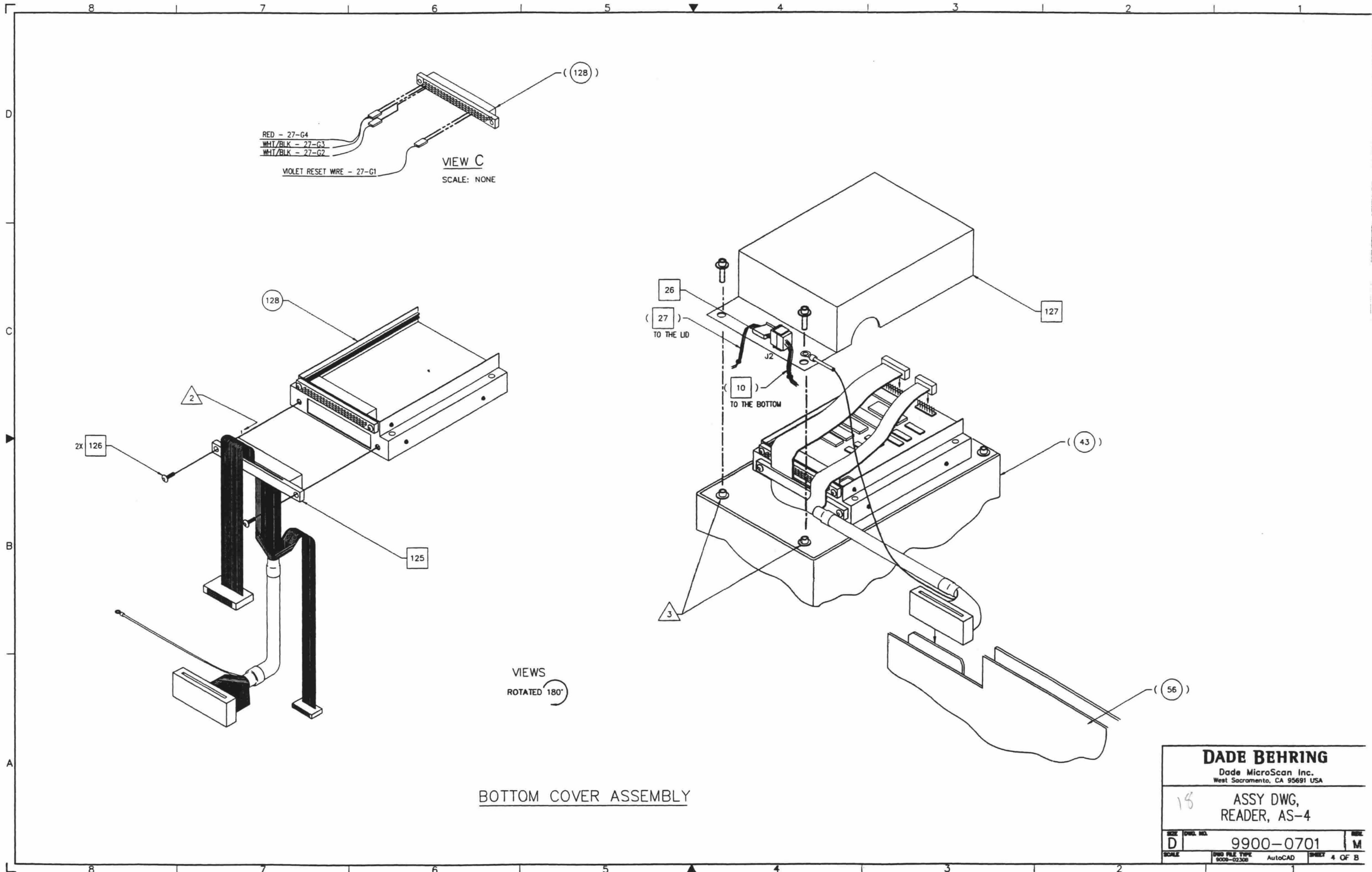




# **BOTTOM COVER ASSEMBLY**

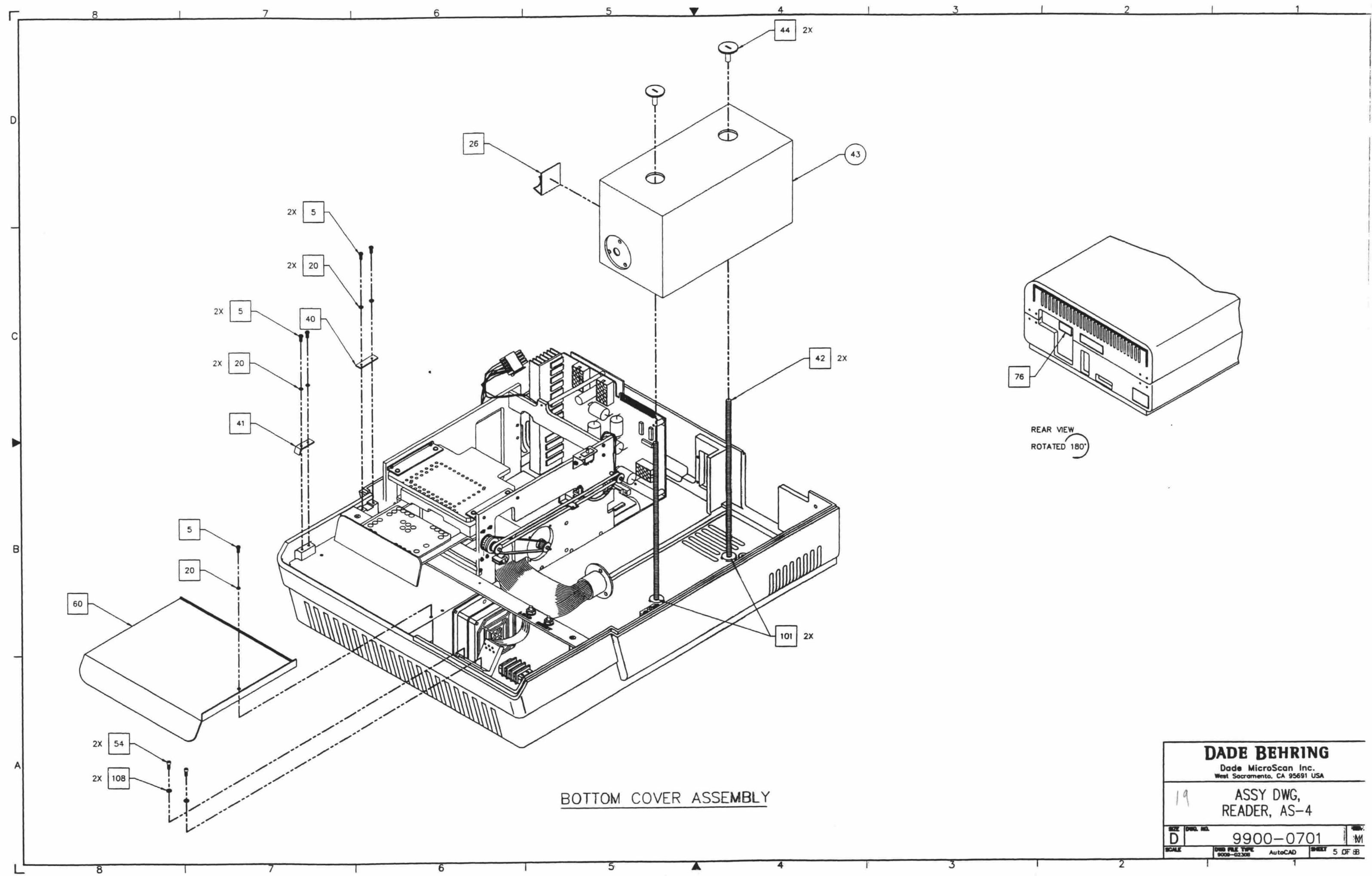


<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
17	ASSY DWG, READER, AS-4		REV
D	9900-0701	M	
SCALE	UNIS FILE TYPE 9006-02308	AutoCAD	SHEET 3 OF 8

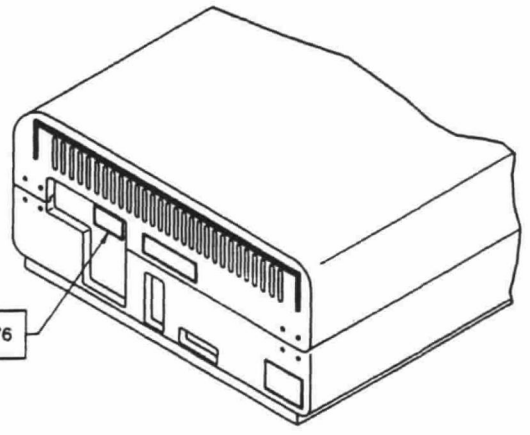


BOTTOM COVER ASSEMBLY

<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
13 ASSY DWG, READER, AS-4			
SIZE D	DWG. NO. 9900-0701	REV. M	
SCALE	DWG. FILE TYPE 9008-02.308	AutoCAD	SHEET 4 OF 8



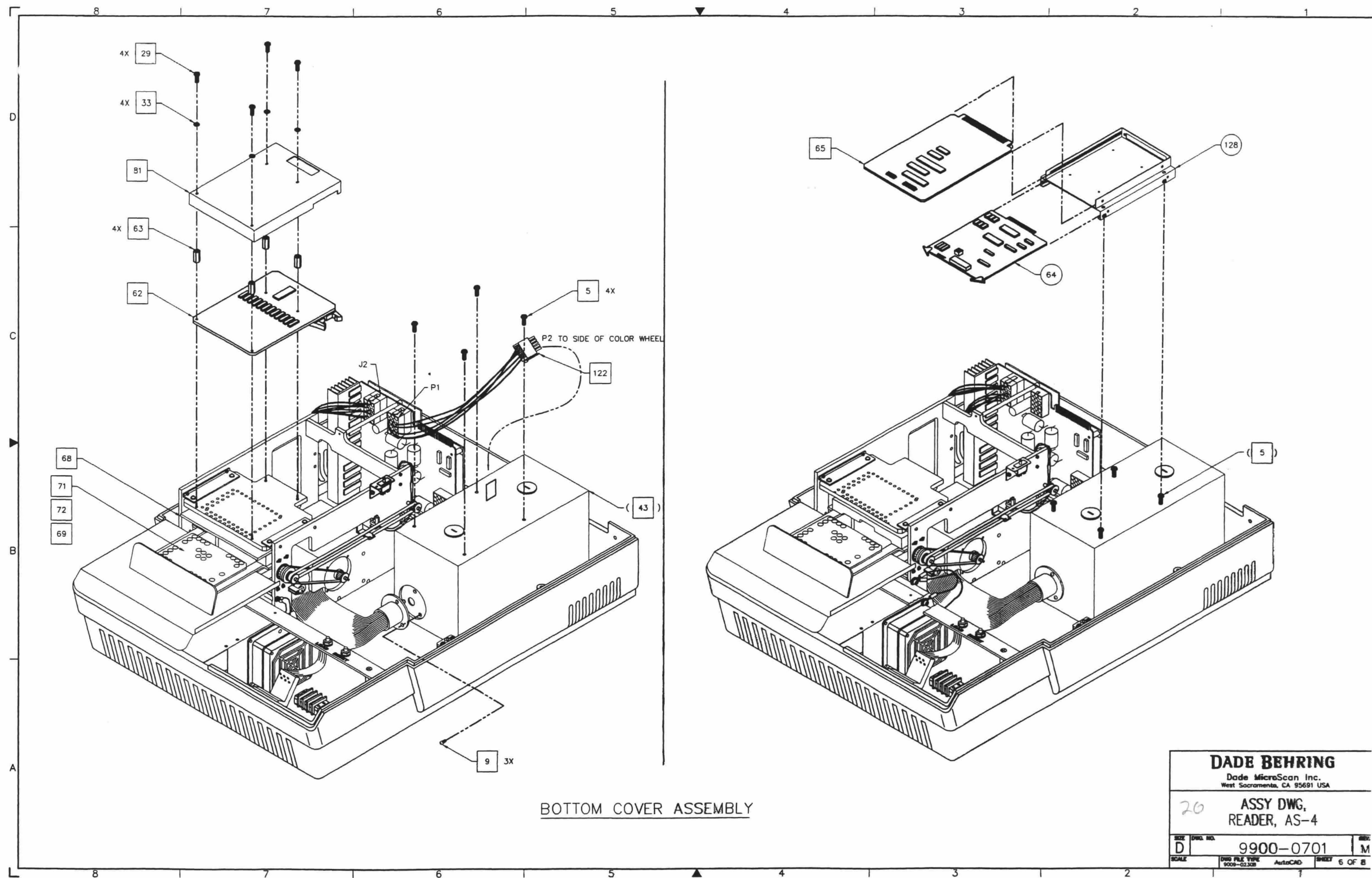
BOTTOM COVER ASSEMBLY



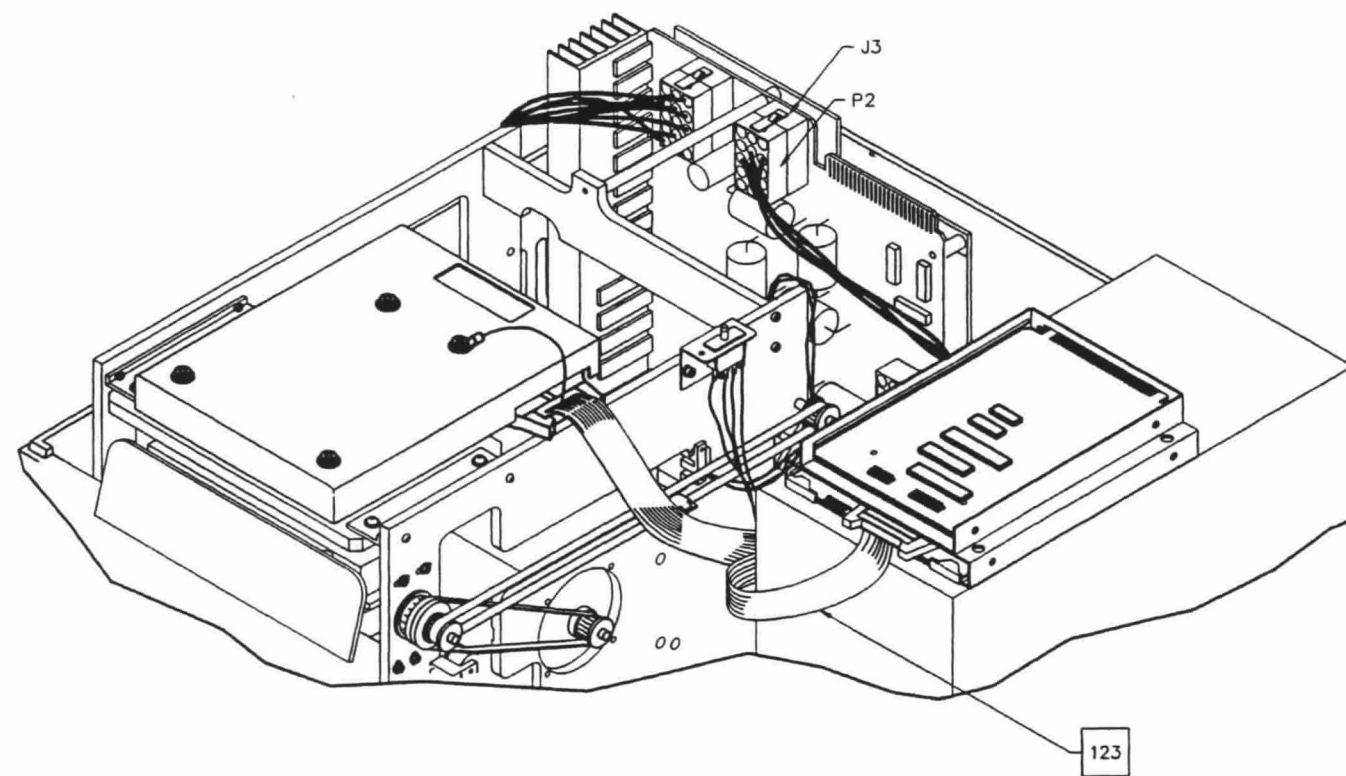
REAR VIEW  
ROTATED 180°

<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
19 ASSY DWG, READER, AS-4			
SIZE D	DWG. NO. 9900-0701	REV. M	
SCALE	DWG. FILE TYPE 9900-02308	AutoCAD	SHEET 5 OF 8

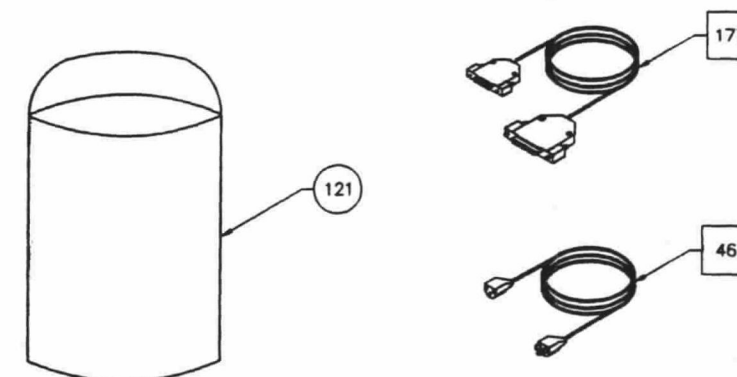
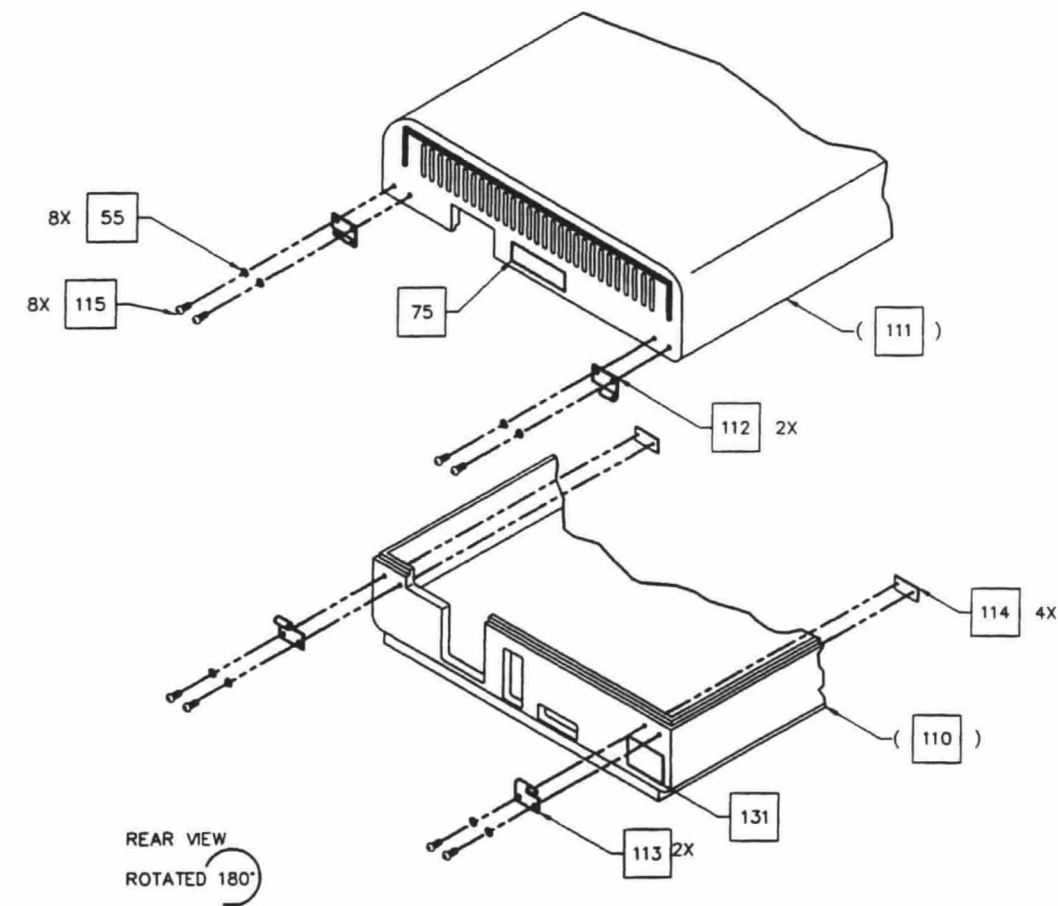






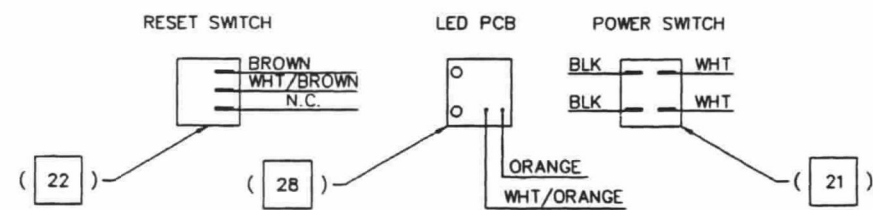
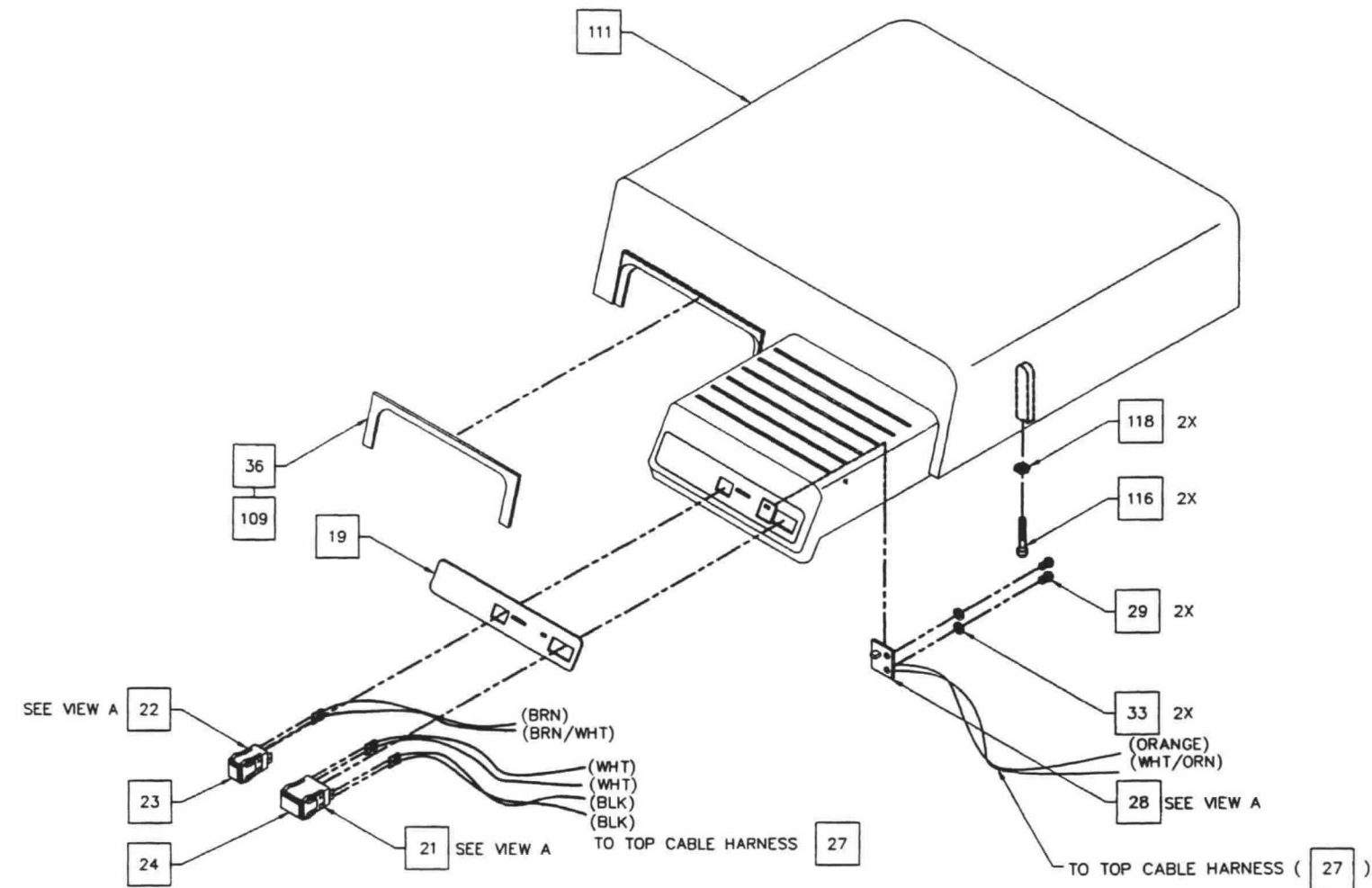


BOTTOM COVER ASSEMBLY



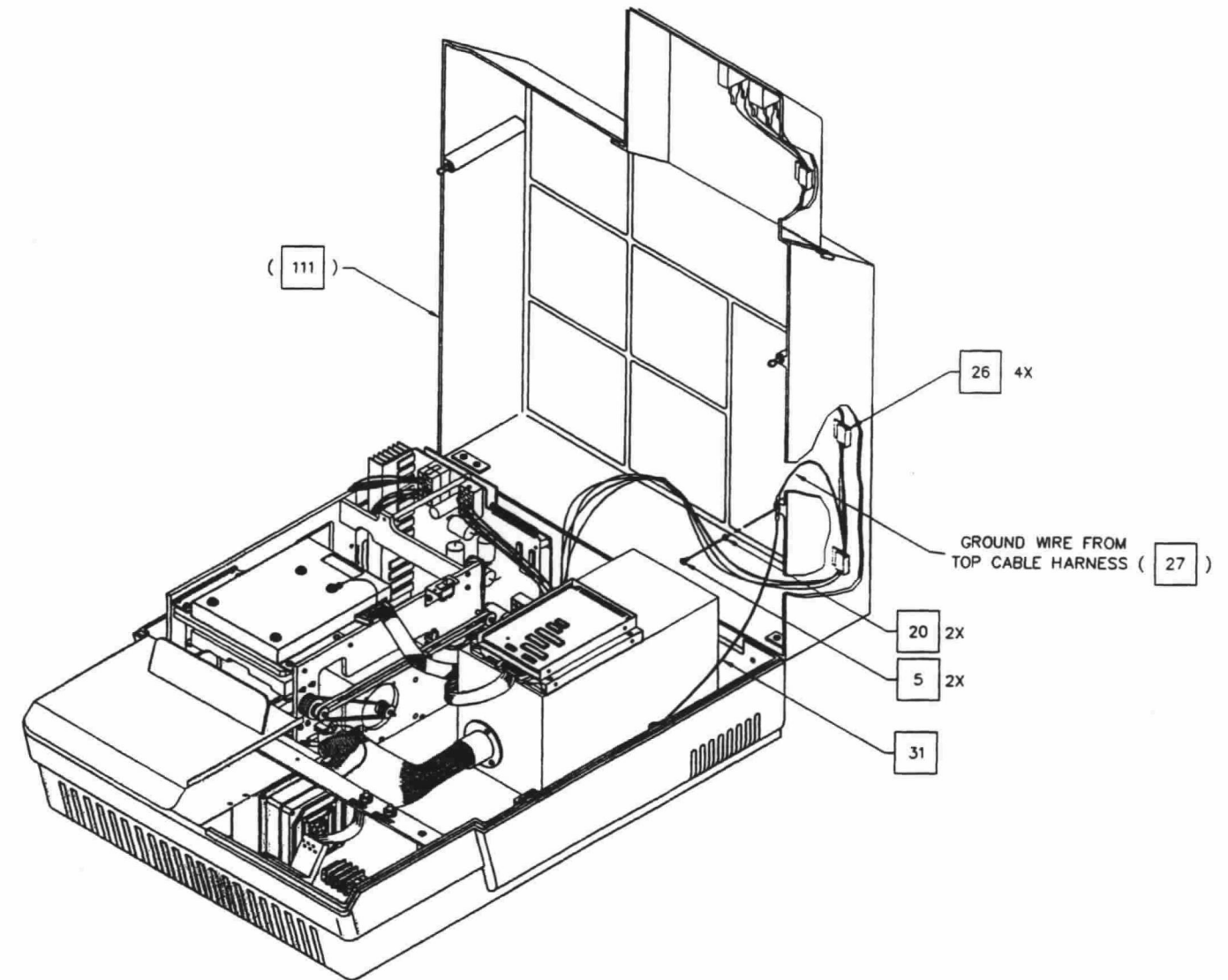
TOP COVER ASSEMBLY

<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
21		ASSY DWG, READER, AS-4	
SIZE	DWG. NO.	REV.	
D	9900-0701	M	
SCALE	DWG. FILE TYPE	AutoCAD	SHEET 7 OF 8

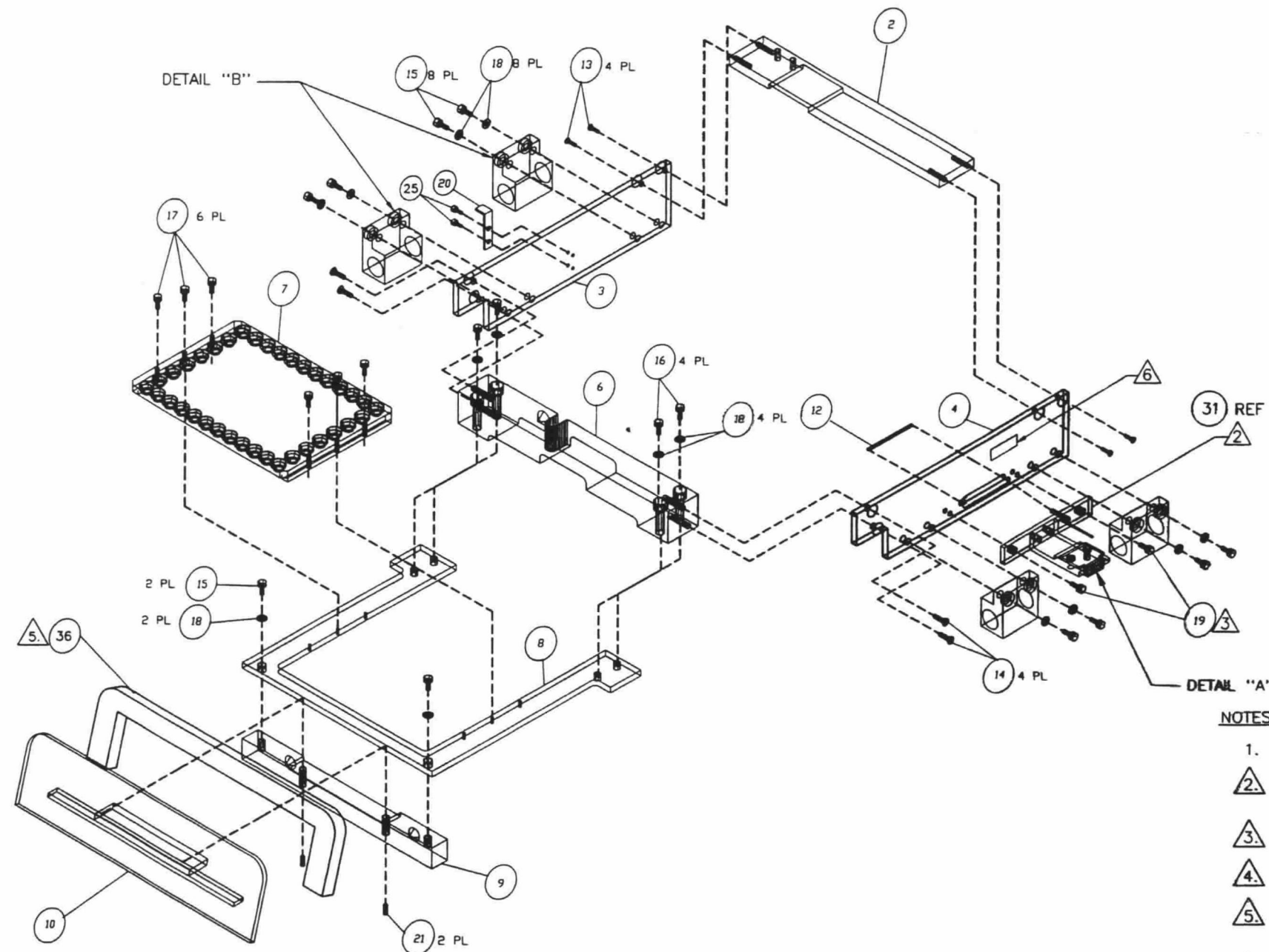


VIEW A  
REAR VIEW  
SCALE: NONE

TOP COVER ASSEMBLY



<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
22		ASSY DWG, READER, AS-4	
SIZE	DWG. NO.	REV.	
D	9900-0701	M	
SCALE	DWG. FILE TYPE 9900-02308	AutoCAD	SHEET 8 OF 8



# NOTES:

- USE PARTS LIST 9800-0737.
- USE ONLY A SMALL AMOUNT OF ITEM (22) BETWEEN ITEM (4) AND ITEM (31).
- USE ITEM (24) ON ITEM (19).
- PIN AND SPRING POST ARE TO BE MOUNTED FLUSH.
- PLACE ITEM (36) ON BACK SIDE OF ITEM (10) USING ITEM (37).
- MARK WITH MICROSCAN PART NUMBER AND CURRENT REVISION LEVEL.
- STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.

INCHES				IMP.	REV.	EDR/WR	APPROVAL	DATE	APPROVAL	DATE	
TOLERANCES ARE:				---	A	PROD	F Quandee	02/09/90	DRAWN	G Singh	01/15/90
FRACTIONS				---	B	01-2761	B Masterson	10/03/90	CHECK	P Duran	07/29/97
DECIMALS				---	C	01-3286	B Masterson	03/13/91	ENGR	F Quandee	02/09/90
ANGLES				---	D	01-3480	K Wang	06/10/91	PROD	WCB	02/09/90
± .XX ±				---	D	NR-3137	W Handie	07/13/92	QA	C VanPelt	02/09/90
± .XXX ±				---	DVP	E 01-7632	T McDowell	03/23/96	MAT	C Dorman	02/09/90
DO NOT SCALE DRAWING				---	RJ	F 01-8754	R Hougess	08/05/97	ACCT	D Rupper	02/09/90
MATERIAL				---	REQ. (CURRENT REV.)		B Quinn	07/30/97			
FINISH				---							

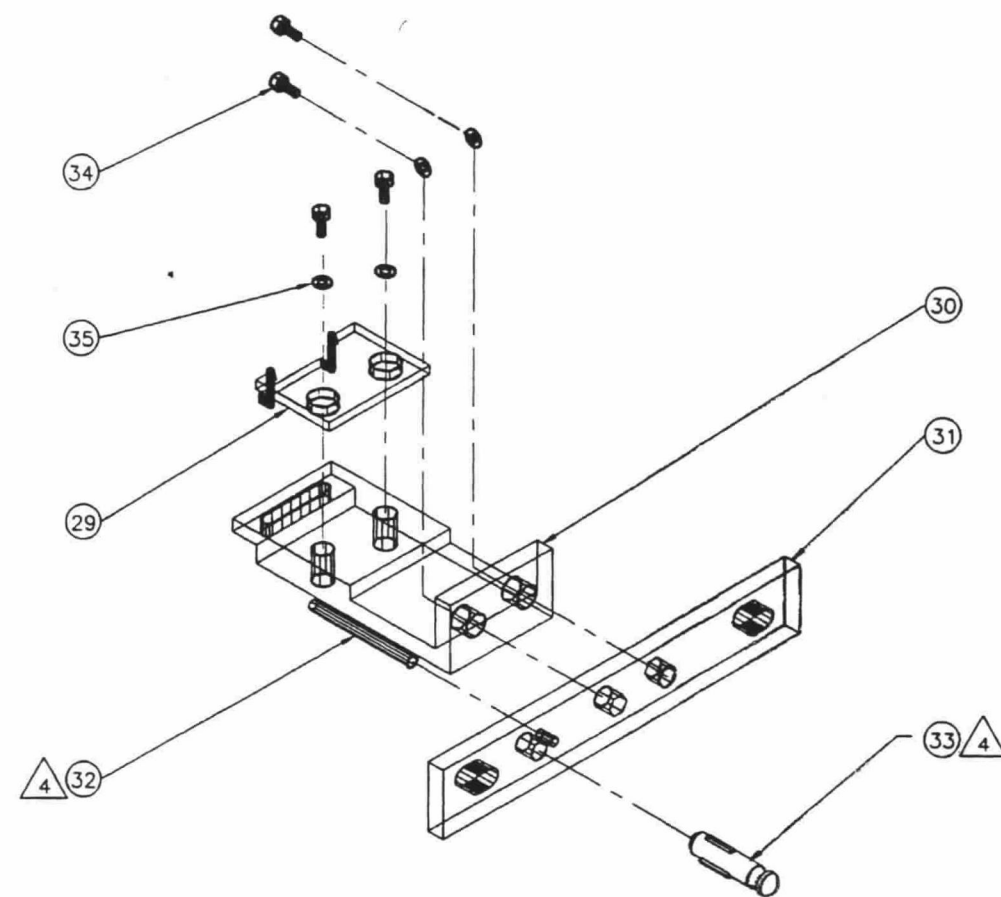
<b>DADE</b>		Dade MicroScan Inc. West Sacramento, CA 95691 USA	
ASSY DWG, DRAWER CARRIER			
SIZE	DWG. NO.	REV.	
C	9900-0737	F	
SCALE	NONE	DWG FILE TYPE	SHEET
		AutoCAD	1 OF 2

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

ASSY DWG,  
DRAWER CARRIER

SIZE	DWG. NO.	REV.
C	9900-0737	F
SCALE	DWG. FILE TYPE	SHEET
NONE	9008-02278 AutoCAD	1 OF 2

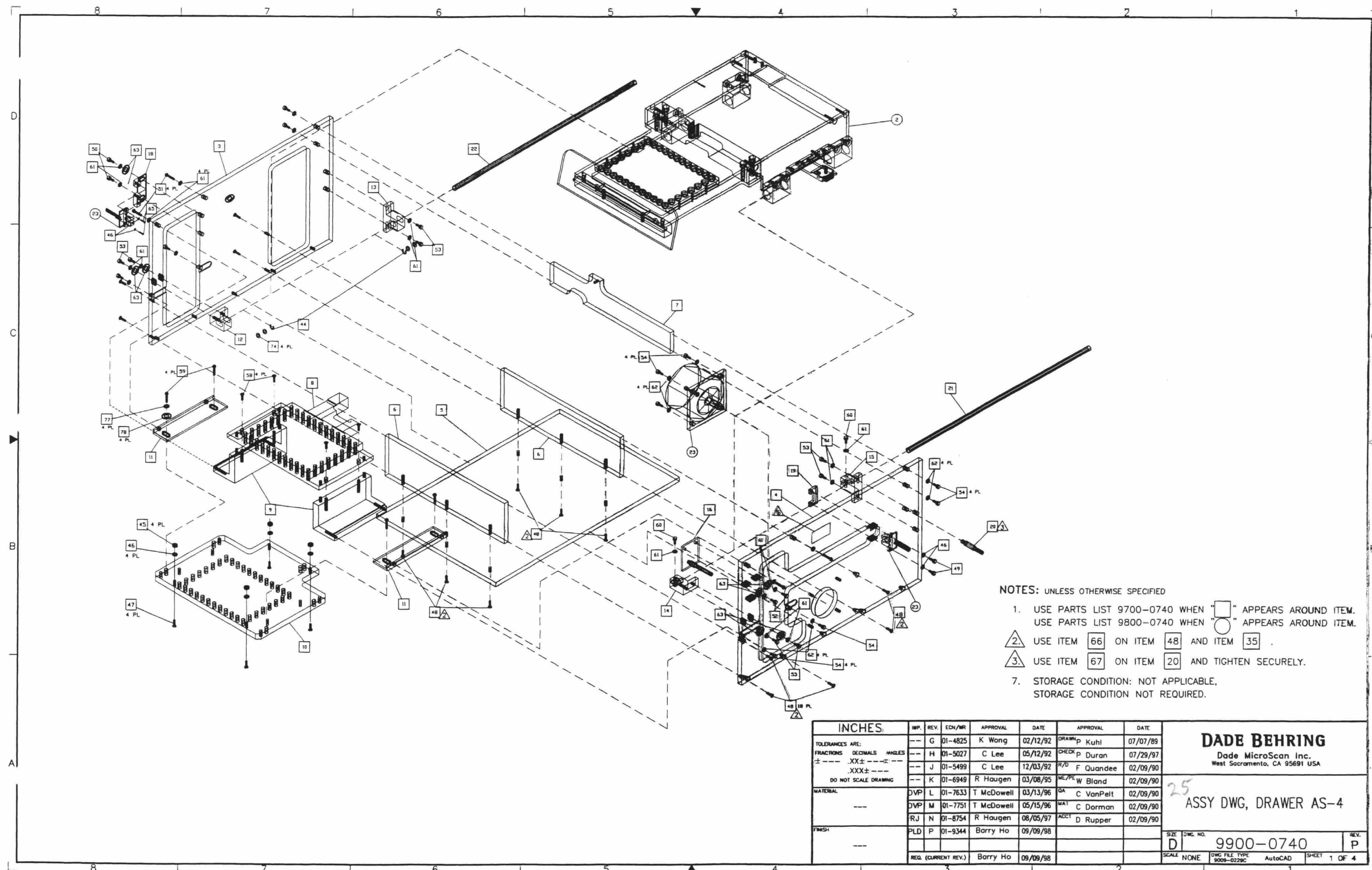
23



DETAIL "A"

<b>DADE</b>		Dade MicroScan Inc. West Sacramento, CA 95691 USA	
ASSY DWG, DRAWER CARRIER			
SIZE	DWG. NO.	REV.	
C	9900-0737	F	
SCALE	DWG. FILE TYPE	SHEET	OF
NONE	9900-0228A AutoCAD	2	2

24



- NOTES: UNLESS OTHERWISE SPECIFIED
- 1. USE PARTS LIST 9700-0740 WHEN "□" APPEARS AROUND ITEM.  
USE PARTS LIST 9800-0740 WHEN "○" APPEARS AROUND ITEM.
  - 2. USE ITEM 66 ON ITEM 48 AND ITEM 35.
  - 3. USE ITEM 67 ON ITEM 20 AND TIGHTEN SECURELY.
  - 7. STORAGE CONDITION: NOT APPLICABLE,  
STORAGE CONDITION NOT REQUIRED.

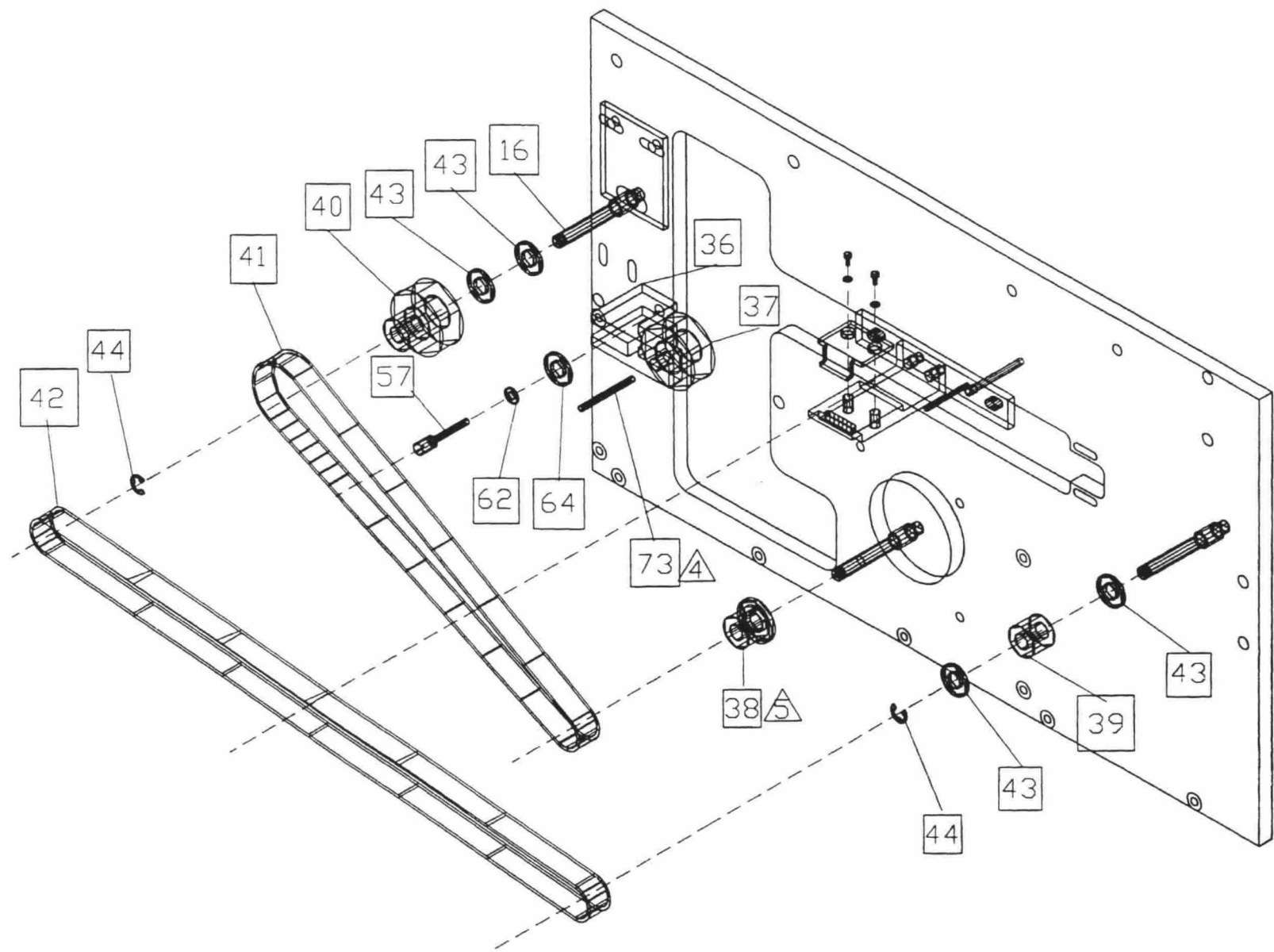
INCHES.				IMP.	REV.	ECH/MR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				---	G	01-4825	K Wong	02/12/92	DRAWN P Kuhl	07/07/89
FRACTIONS DECIMALS ANGLES				---	H	01-5027	C Lee	05/12/92	CHECK P Duran	07/29/97
± --- .XX± --- °				---	J	01-5499	C Lee	12/03/92	R/D F Quadee	02/09/90
DO NOT SCALE DRAWING				---	K	01-6949	R Haugen	03/08/95	ME/PE W Bland	02/09/90
MATERIAL				DVP	L	01-7633	T McDowell	03/13/96	GA C VanPelt	02/09/90
---				DVP	M	01-7751	T McDowell	05/15/96	MA1 C Dorman	02/09/90
FINISH				RJ	N	01-8754	R Haugen	08/05/97	ACCT D Rupper	02/09/90
---				PLD	P	01-9344	Barry Ho	09/09/98		
REQ. (CURRENT REV.)							Barry Ho	09/09/98		

**DADE BEHRING**  
Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

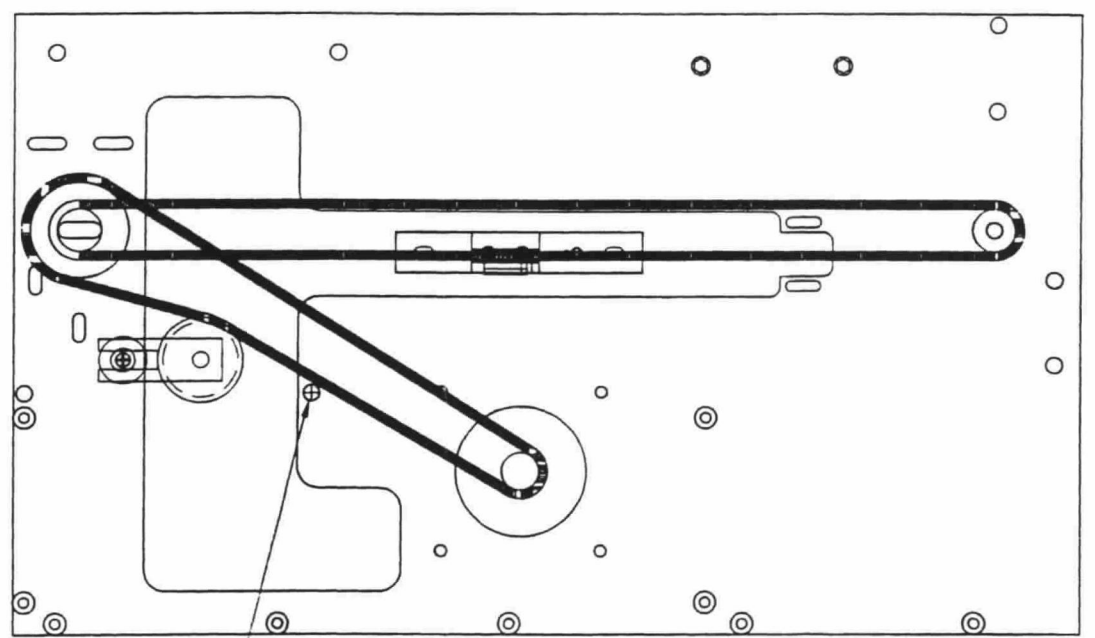
25  
ASSY DWG, DRAWER AS-4

SIZE D DWG. NO. 9900-0740 REV. P  
SCALE NONE DWG. FILE TYPE 9009-0229C AutoCAD SHEET 1 OF 4



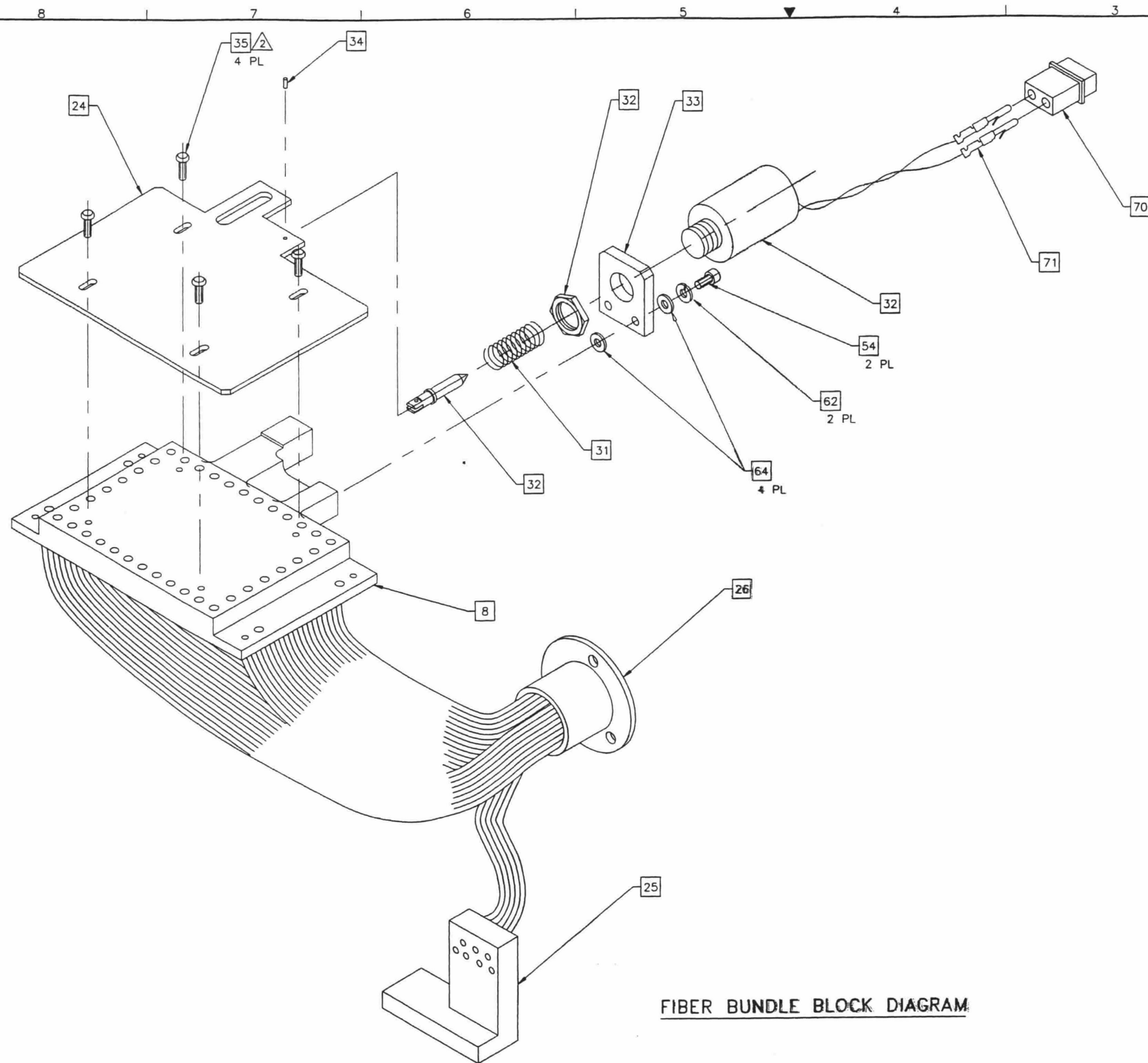


DRIVE SYSTEM DIAGRAM



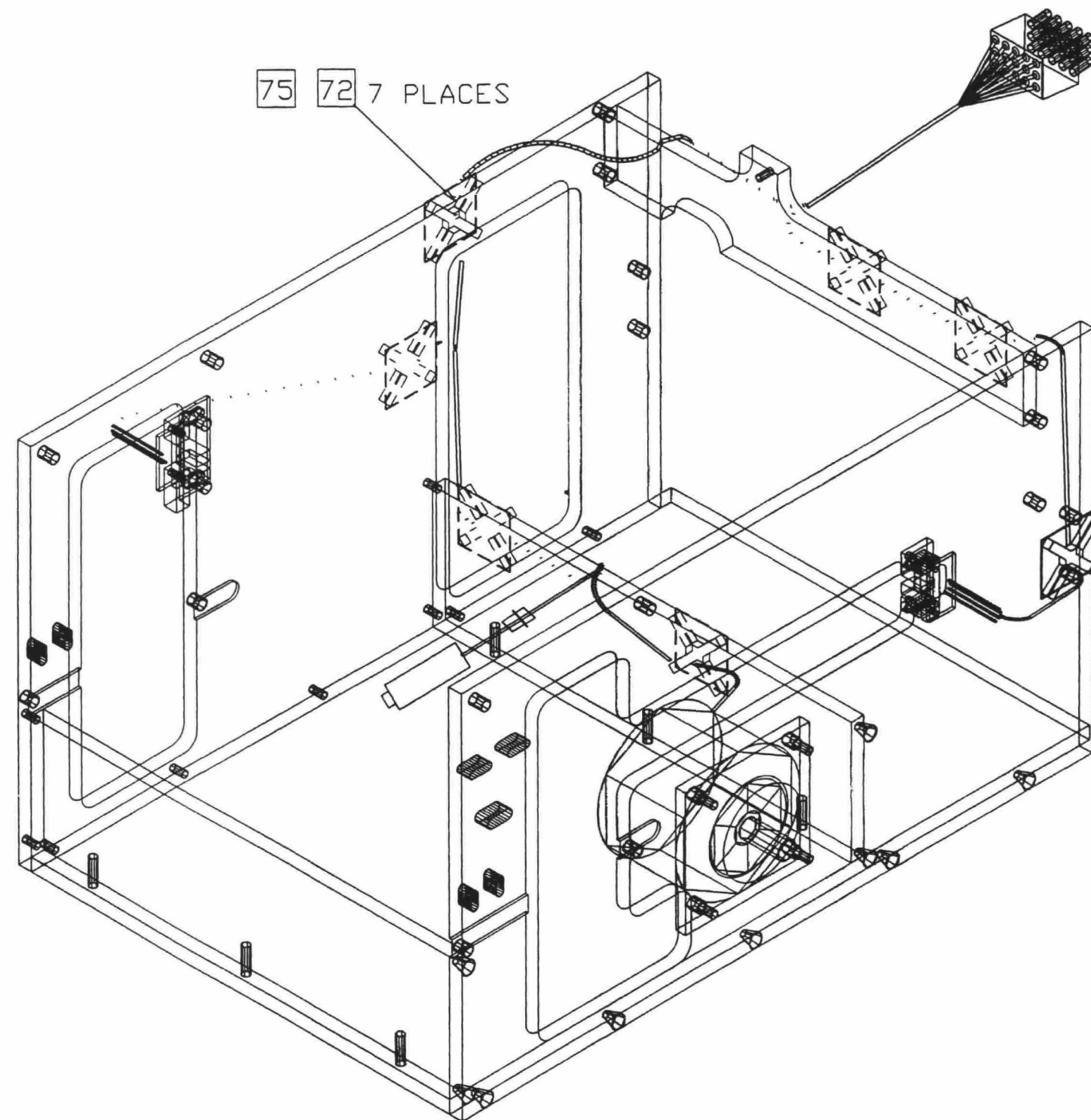
- NOTES:
- △ 4. PRESS ITEM 73 INTO ITEMS 36 AND 37.
  - △ 5. APPLY ITEM 66 TO SET SCREWS OF ITEM 38.
  - △ 6. MARK WITH MICROSCAN PART NUMBER AND CURRENT REVISION LEVEL.

<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
24 ASSY DWG, DRAWER AS-4			
SIZE	DWG. NO.	REV.	
D	9900-0740	P	
SCALE	DWG. FILE TYPE	SHEET	
NONE	9909-02308 AutoCAD	2 OF 4	

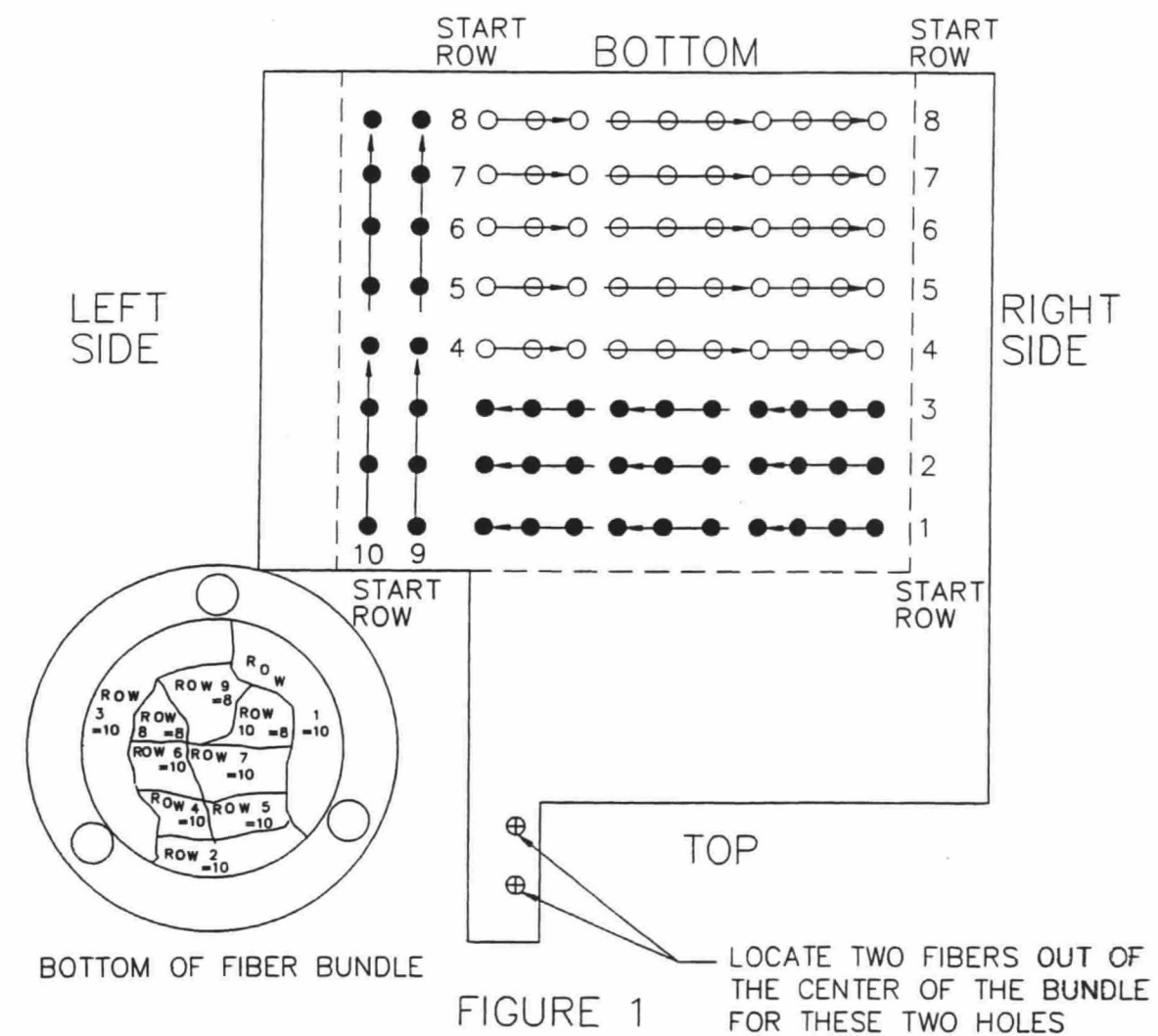


FIBER BUNDLE BLOCK DIAGRAM

<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
ASSY DWG, DRAWER AS-4			
SIZE D	DWG. NO. 9900-0740	REV. P	
SCALE NONE	DWG. FILE TYPE 9008-02308	AutoCAD	SHEET 3 OF 4



WIRE ROUTING DIAGRAM



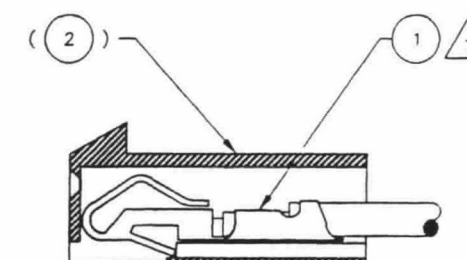
<b>DADE BEHRING</b>			
Dade MicroScan Inc. West Sacramento, CA 95691 USA			
28 ASSY DWG, DRAWER AS-4			
SIZE D	DWG. NO. 9900-0740	REV. P	
SCALE NONE	DWG FILE TYPE 9009-02308	AutoCAD	SHEET 4 OF 4



J2 INTERCONNECT TABLE		
FROM	WIRE COLOR CODE	TO
J2-1	BLU	A2
J2-2	BLU/WHT	A3
J2-3	YEL	A1
J2-4	YEL/WHT	A4
J2-5	----	N/C
J2-6	----	N/C
J2-7	----	N/C
J2-8	----	N/C

J1 INTERCONNECT TABLE		
FROM	WIRE COLOR CODE	TO
J1-1	----	N/C
J1-2	----	N/C
J1-3	WHT	A6
J1-4	----	N/C
J1-5	BLK	A5

WIRE TABLE										
LOAD #	WIRE ITEM#	COLOR	GAGE	LNTH (IN.)	FROM	TERM. W/ ITEM#	PROC. END	TO	TERM. W/ ITEM#	SIGNAL NAME
1	8	BLU	18	6.50	J2-1	1	-	A2	6	GND
2	9	BLU/WHT	22	6.75	J2-2	1	-	A3	6	GNDS
3	7	YEL	18	5.75	J2-3	1	-	A1	6	+12
4	10	YEL/WHT	22	6.75	J2-4	1	-	A4	6	+12S
5	12	WHT	18	6.50	J1-3	1	-	A6	6	AC-NEU
6	11	BLK	18	5.50	J1-5	1	-	A5	6	AC-HOT



SECTION A-A  
(ITEM 2 SHOWN. ITEM 3 SIMILAR).

# NOTES: UNLESS OTHERWISE SPECIFIED

- USE PARTS LIST NUMBER 9800-0954.
- PROCESS WIRE ENDS IN ACCORDANCE WITH TERMINAL MANUFACTURER'S SPECIFICATIONS.
- IDENTIFICATION MARK HARNESS CABLE TIE MARKER WITH PART NUMBER 9800-0954.
- PERMANENT MARK CONNECTOR WITH "J1".
- PERMANENT MARK CONNECTOR WITH "J2".
- PART TO COMPLY WITH U.L. PROCESSES, VENDOR TO MARK PACKAGE WITH VENDOR'S U.L. IDENTIFICATION.
- INSERT PIN ITEM 1 INTO CONNECTOR ITEM 2 OR 3 AS SHOWN, 6 PLACES.
- STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.
- PIN# 3015-2204, USE CRIMPER; MOLEX 1719C.
- PIN# 3025-0618, USE CRIMPER; AMP 83-001.
- PIN TO PIN CONTINUITY TEST REQUIRED.

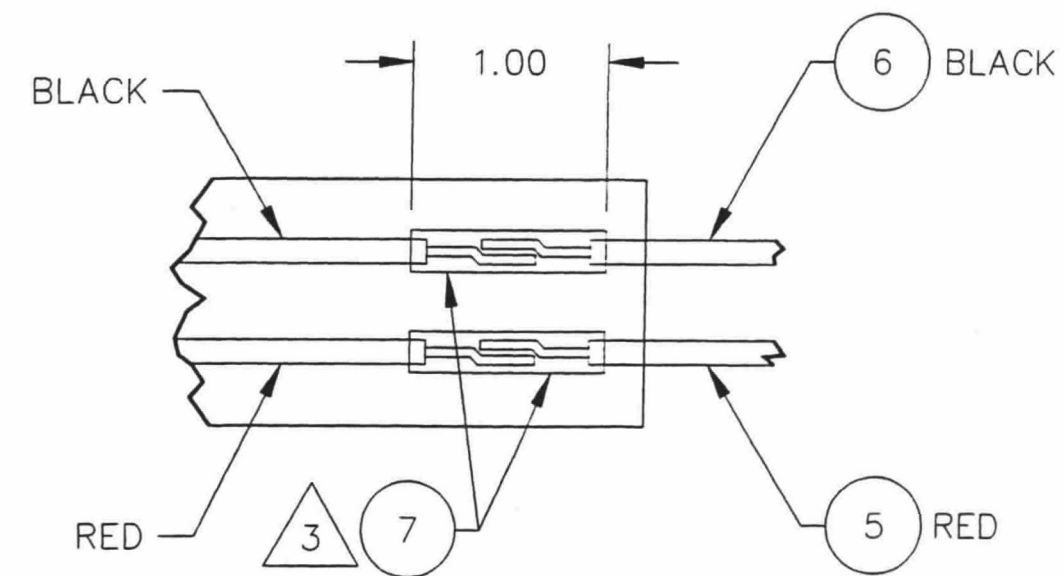
SEE SEPARATE PARTS LIST--P/N 9800-0954

INCHES		REV.	EDT/WR	APPROVAL	DATE	APPROVAL	DATE	DADE BEHRING Dade MicroScan Inc. West Sacramento, CA 95691 USA	
TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±1/32 .005 ±1/2° ±.0005 ±.0005 DO NOT SCALE DRAWING		C	01-2855	W Hardie	11/06/90	GRABUS Everett	07/19/90		
		D	01-4084	K Wong	08/29/91	R/D W Hardie	08/02/90		
MATERIAL  SEE BOM		E	01-5087	C Lee	05/26/92	ME/PER Klossinski	08/20/90	30 CABLE ASSEMBLY POWER SUPPLY, AS-4	
		F	01-6635	D Carr	08/22/94	GA C VanPelt	08/02/90		
		LSL	G	01-7954	R Haugen	07/24/96	MAT J Nicholas		
FINISH  ---		RJ	H	01-8821	R Haugen	09/04/97	ACT N/A	N/A	SIZE D DWG. NO. 9900-0954
		PLD	J	01-9006	M Murphy	11/14/97	C/O N/A	N/A	
		PLD	K	01-9513	C Her	01/22/99	PA N/A	N/A	
REQ. (CURRENT REV.)		ORD (CURRENT REV.)		R Haugen	01/22/99			SCALE 1:1 DWG. FILE TYPE 9009-02290 AutoCAD SHEET 1 OF 1	
		REQ. (CURRENT REV.)		C Her	01/22/99				

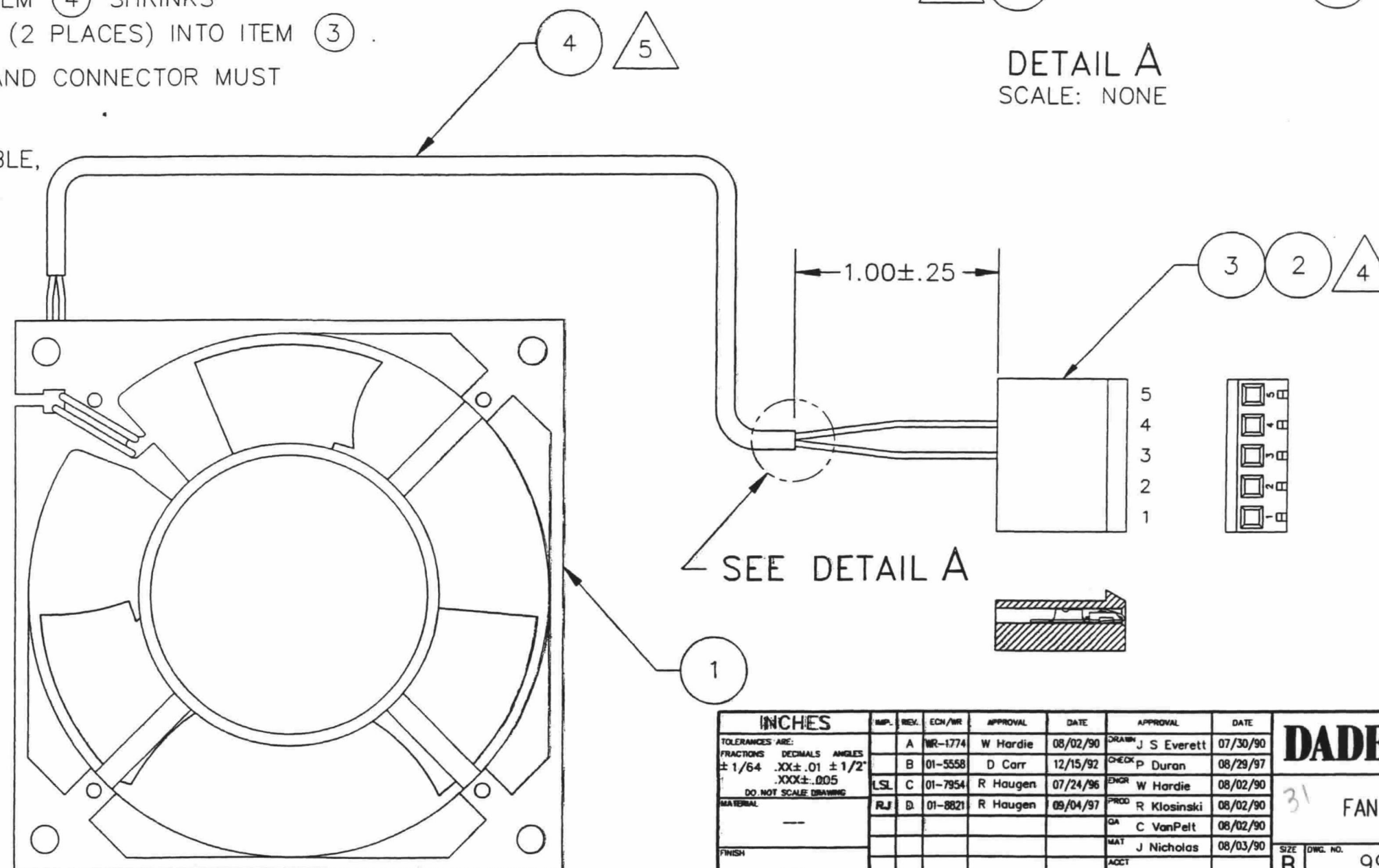


NOTES: UNLESS OTHERWISE SPECIFIED

1. USE PARTS LIST 9800-0955.
2. DO NOT CUT WIRING FROM FAN.
3. STRIP WIRE INSULATION A MINIMUM OF .37 FROM ALL WIRE ENDS AND SOLDER MATING WIRES TOGETHER WITH AT LEAST .25 OVERLAP. HEAT SHRINK ITEM (7) SO THAT NONE OF THE SOLDERED JOINTS ARE SHOWING.
4. ADD ITEM (2) TO UNSOLDERED ENDS OF ITEMS (5) AND (6) PER TERMINAL MANUFACTURER'S SPECIFICATIONS.
5. CUT ITEM (4) TO  $11.00 \pm .25$ , POSITION ITEM (4)  $1.00 \pm .25$  FROM END, HEAT UNTIL ITEM (4) SHRINKS OVER CABLE AND INSERT ITEM (2) (2 PLACES) INTO ITEM (3).
6. OVERALL DISTANCE BETWEEN FAN AND CONNECTOR MUST BE A MINIMUM OF 12.00.
7. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.



DETAIL A  
SCALE: NONE



INCHES			IMP.	REV.	EDH/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				A	WR-1774	W Hardie	08/02/90	DRBN J S Everett	07/30/90
FRACTIONS DECIMALS ANGLES				B	01-5558	D Carr	12/15/92	CHCK P Duran	08/29/97
± 1/64 .XX± .01 ± 1/2°				LSL C	01-7954	R Haugen	07/24/96	ENGR W Hardie	08/02/90
.XXX± .005				RLJ D	01-8821	R Haugen	09/04/97	PROD R Klosinski	08/02/90
DO NOT SCALE DRAWING								QA C VanPelt	08/02/90
MATERIAL								MAT J Nicholas	08/03/90
FINISH								ACCT	
REV. (CURRENT REV.)					B Quinn	09/05/97			

**DADE**

Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

31

FAN ASSEMBLY, DC

SIZE B

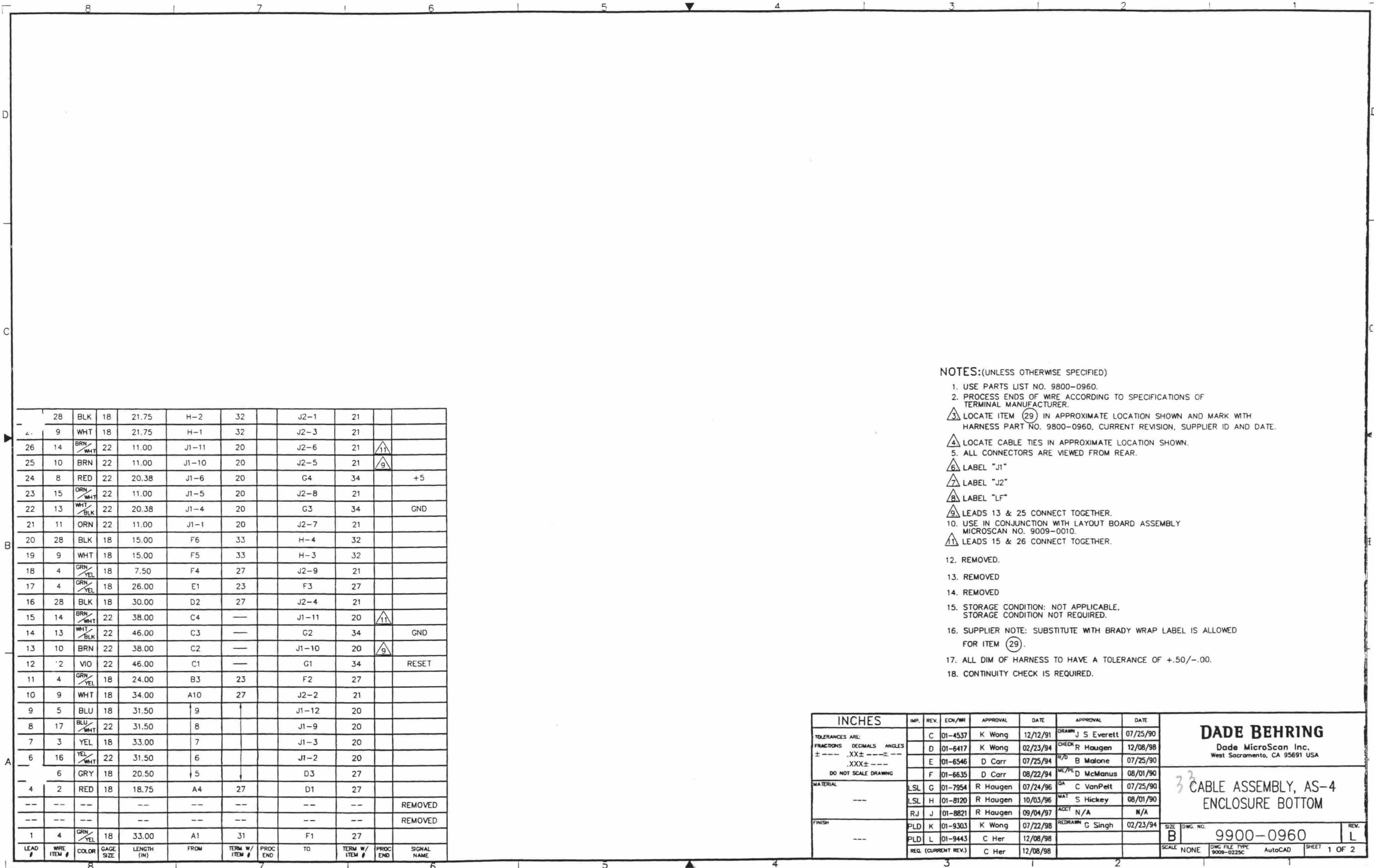
DWG. NO. 9900-0955

SCALE 1:1

DWG FILE TYPE 9900-02235 AutoCAD

SHEET 1 OF 1

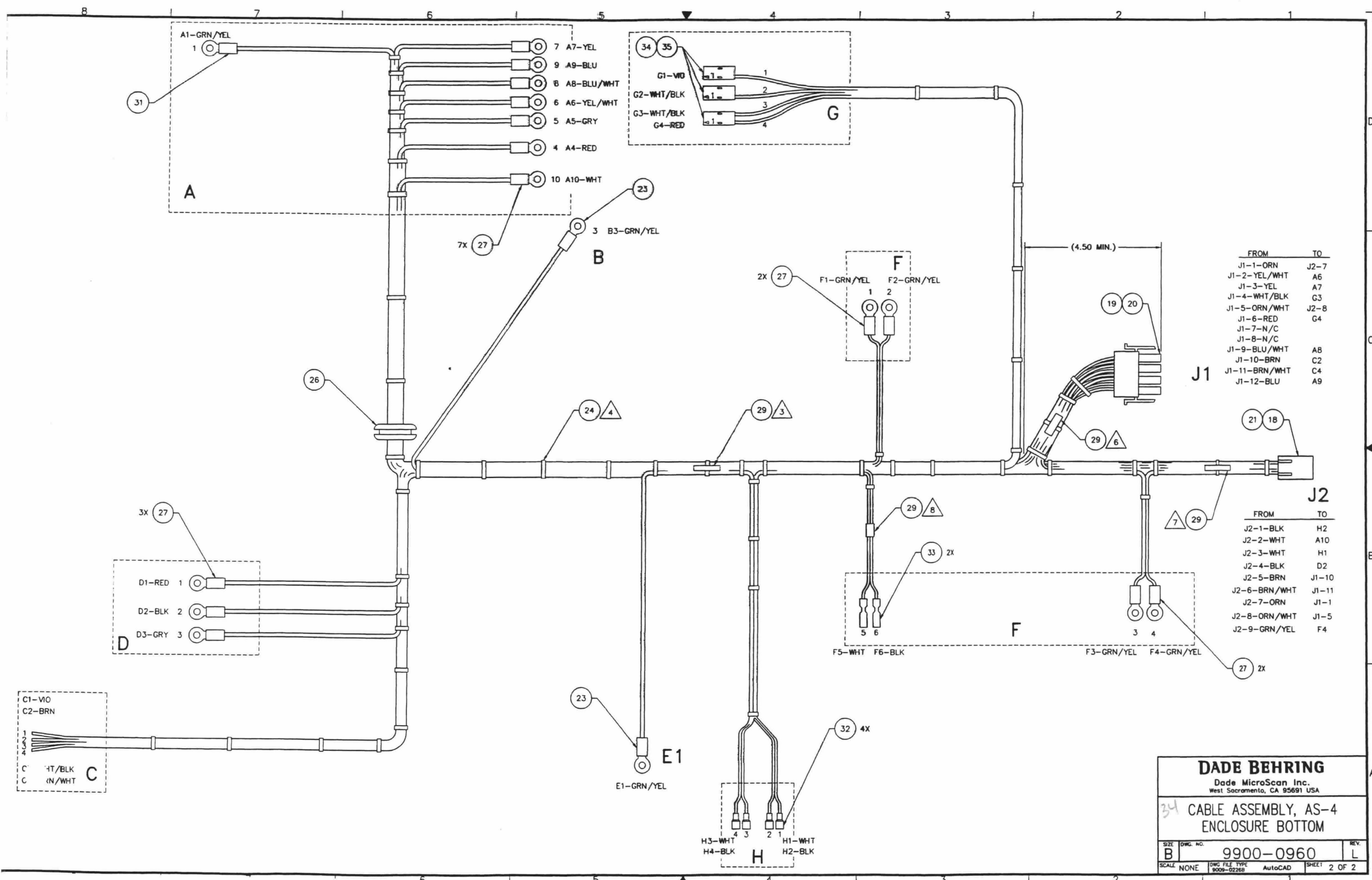




	28	BLK	18	21.75	H-2	32		J2-1	21		
	9	WHT	18	21.75	H-1	32		J2-3	21		
26	14	BRN WHT	22	11.00	J1-11	20		J2-6	21	11	
25	10	BRN	22	11.00	J1-10	20		J2-5	21	9	
24	8	RED	22	20.38	J1-6	20		G4	34		+5
23	15	ORN WHT	22	11.00	J1-5	20		J2-8	21		
22	13	WHT BLK	22	20.38	J1-4	20		G3	34		GND
21	11	ORN	22	11.00	J1-1	20		J2-7	21		
20	28	BLK	18	15.00	F6	33		H-4	32		
19	9	WHT	18	15.00	F5	33		H-3	32		
18	4	GRN YEL	18	7.50	F4	27		J2-9	21		
17	4	GRN YEL	18	26.00	E1	23		F3	27		
16	28	BLK	18	30.00	D2	27		J2-4	21		
15	14	BRN WHT	22	38.00	C4	---		J1-11	20	11	
14	13	WHT BLK	22	46.00	C3	---		G2	34		GND
13	10	BRN	22	38.00	C2	---		J1-10	20	9	
12	12	VIO	22	46.00	C1	---		G1	34		RESET
11	4	GRN YEL	18	24.00	B3	23		F2	27		
10	9	WHT	18	34.00	A10	27		J2-2	21		
9	5	BLU	18	31.50	9	↑		J1-12	20		
8	17	BLU WHT	22	31.50	8			J1-9	20		
7	3	YEL	18	33.00	7			J1-3	20		
6	16	YEL WHT	22	31.50	6			J1-2	20		
	6	GRY	18	20.50	5	↑		D3	27		
4	2	RED	18	18.75	A4	27		D1	27		
--	--	--	--	--	--	--		--	--		REMOVED
--	--	--	--	--	--	--		--	--		REMOVED
1	4	GRN YEL	18	33.00	A1	31		F1	27		
LEAD #	WIRE ITEM #	COLOR	GAGE SIZE	LENGTH (IN)	FROM	TERM W/ ITEM #	PROC END	TO	TERM W/ ITEM #	PROC END	SIGNAL NAME

- NOTES:(UNLESS OTHERWISE SPECIFIED)
- 1. USE PARTS LIST NO. 9800-0960.
  - 2. PROCESS ENDS OF WIRE ACCORDING TO SPECIFICATIONS OF TERMINAL MANUFACTURER.
  - 3. LOCATE ITEM (29) IN APPROXIMATE LOCATION SHOWN AND MARK WITH HARNESS PART NO. 9800-0960, CURRENT REVISION, SUPPLIER ID AND DATE.
  - 4. LOCATE CABLE TIES IN APPROXIMATE LOCATION SHOWN.
  - 5. ALL CONNECTORS ARE VIEWED FROM REAR.
  - 6. LABEL "J1"
  - 7. LABEL "J2"
  - 8. LABEL "LF"
  - 9. LEADS 13 & 25 CONNECT TOGETHER.
  - 10. USE IN CONJUNCTION WITH LAYOUT BOARD ASSEMBLY MICROSCAN NO. 9009-0010.
  - 11. LEADS 15 & 26 CONNECT TOGETHER.
  - 12. REMOVED.
  - 13. REMOVED
  - 14. REMOVED
  - 15. STORAGE CONDITION: NOT APPLICABLE. STORAGE CONDITION NOT REQUIRED.
  - 16. SUPPLIER NOTE: SUBSTITUTE WITH BRADY WRAP LABEL IS ALLOWED FOR ITEM (29).
  - 17. ALL DIM OF HARNESS TO HAVE A TOLERANCE OF +.50/- .00.
  - 18. CONTINUITY CHECK IS REQUIRED.

INCHES				IMP.	REV.	ECH/WR	APPROVAL	DATE	APPROVAL	DATE	<div>DADE BEHRING</div> <div>Dade MicroScan Inc. West Sacramento, CA 95691 USA</div> <div>33 CABLE ASSEMBLY, AS-4 ENCLOSURE BOTTOM</div>					
TOLERANCES ARE:					C	01-4537	K Wong	12/12/91	DRAWN	J S Everett				07/25/90		
FRACTIONS    DECIMALS    ANGLES					D	01-6417	K Wong	02/23/94	CHECK	R Haugen				12/08/98		
± ---    .XX±    --- ± ---    .XXX±    ---					E	01-6546	D Carr	07/25/94	R/D	B Malone				07/25/90		
DO NOT SCALE DRAWING					F	01-6635	D Carr	08/22/94	WE/FE	D McManus	08/01/90					
MATERIAL  ---				LSL	G	01-7954	R Haugen	07/24/96	QA	C VanPelt	07/25/90					
				LSL	H	01-8120	R Haugen	10/03/96	MAT	S Hickey	08/01/90					
				RJ	J	01-8821	R Haugen	09/04/97	ACCT	N/A	N/A					
FINISH  ---				PLD	K	01-9303	K Wong	07/22/98	REDRAWN	G Singh	02/23/94					
				PLD	L	01-9443	C Her	12/08/98								
				REQ. (CURRENT REV.)				C Her	12/08/98							
												SIZE	DWG. NO.		REV.	
												B	9900-0960		L	
												SCALE	NONE	DWG. FILE TYPE 9009-0225C	AutoCAD	SHEET 1 OF 2



**DADE BEHRING**  
 Dade MicroScan Inc.  
 West Sacramento, CA 95691 USA

34 CABLE ASSEMBLY, AS-4  
 ENCLOSURE BOTTOM

SIZE	DWG. NO.	REV.
B	9900-0960	L
SCALE	DWG. FILE TYPE	SHEET
NONE	9009-02268 AutoCAD	2 OF 2







NOTES: UNLESS OTHERWISE SPECIFIED

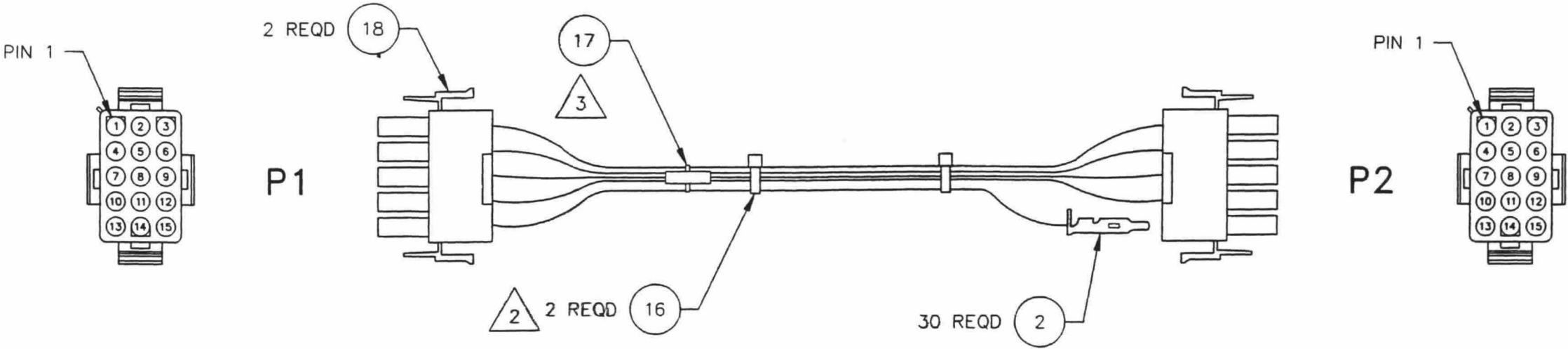
1. USE PARTS LIST 9800-1835.

2. SECURE WIRE, ITEMS (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), AND (15) WITH TIE WRAP, ITEM (16) IN 2 PLACES AS SHOWN.

3. MARK WITH MICROSCAN PART NUMBER AND CURRENT REVISION LEVEL.

4. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.

5. PIN TO PIN CONTINUITY TEST REQUIRED.

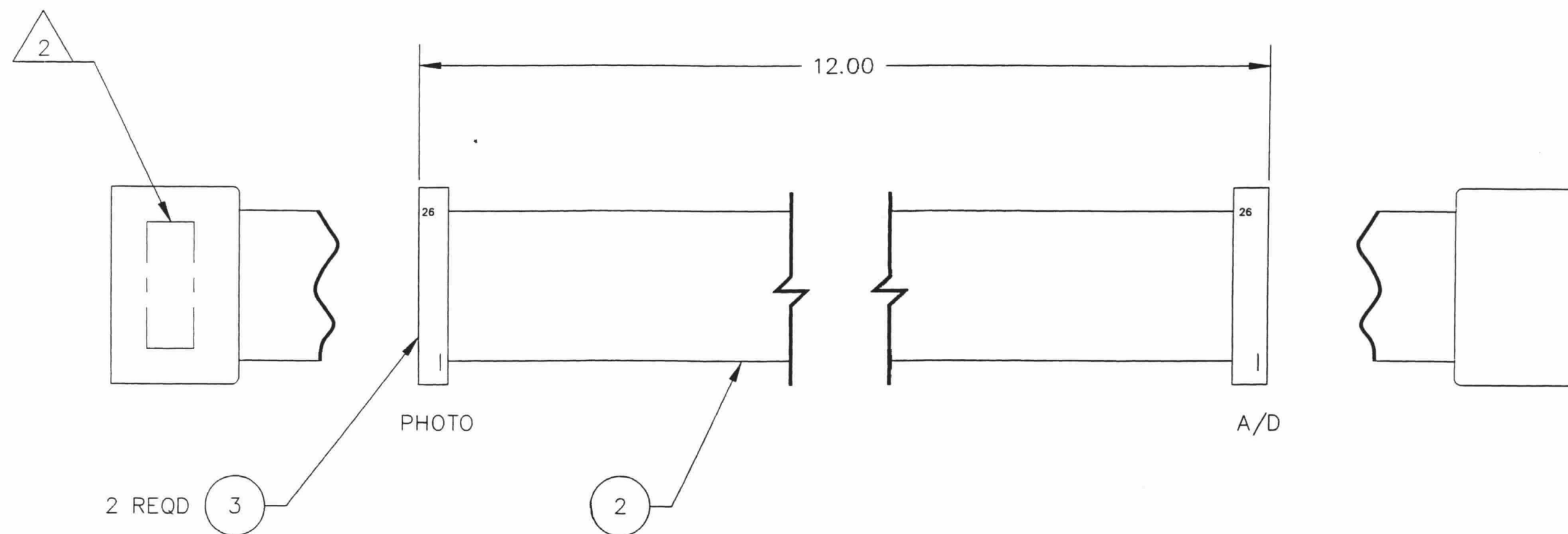


15	4	BRN	22	12.00	P1-15	18		P2-15	18		
14	10	VIO	22		P1-14			P2-14			
13	14	BLK	18		P1-13			P2-13			
12	5	RED	22		P1-12			P2-12			
11	10	VIO			P1-11			P2-11			
10	3	BLK			P1-10			P2-10			
9	6	ORN			P1-9			P2-9			
8	13	WHT/BLK			P1-8			P2-8			
7	11	GRY			P1-7			P2-7			
6	7	YEL			P1-6			P2-6			
	8	GRN			P1-5			P2-5			
4	9	BLU			P1-4			P2-4			
3	8	GRN			P1-3			P2-3			
2	12	WHT	22		P1-2			P2-2			
1	15	RED	18	12.00	P1-1	18		P2-1	18		
LEAD #	WIRE ITEM #	COLOR	GAGE SIZE	LENGTH (IN)	FROM	TERM W/ ITEM #	PROC END	TO	TERM W/ ITEM #	PROC END	SIGNAL NAME

INCHES				IMP.	REV.	ECN/BR	APPROVAL	DATE	APPROVAL	DATE	DADE BEHRING Dade MicroScan Inc. West Sacramento, CA 95691 USA	
TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±.001 ±.001 ±.001 DO NOT SCALE DRAWING					A	WR-3358	W Hardie	11/02/92	DRN W Robinson	10/30/92		
					B	01-6631	D Teeter	08/22/94	R/D W Hardie	11/02/92		
					LSL	C 01-7954	R Haugen	07/24/96	REV J Griffin	11/02/92		
					RJ	D 01-8688	R Haugen	07/30/97	GA T McDowell	11/02/92	36 ASSEMBLY DRAWING, CABLE, PWR BOARD COLORWHEEL	
					PLD	E 01-9513	C Her	01/22/99	MAY C Thompson	11/03/92		
									ADD N/A	N/A		
									REV N/A	N/A		
									PA N/A	N/A		
											SIZE DWD NO. 9900-1835	
											B 1 OF 1	
											SCALE NONE DWD FILE TYPE 9009-02250 AutoCAD	
											REV. E	

# NOTES: UNLESS OTHERWISE SPECIFIED

1. USE PARTS LIST 9800-1837.
2. MARK WITH MICROSCAN PART NUMBER AND CURRENT REVISION LEVEL.
3. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.



INCHES				IMP.	REV.	EDH/NR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				-	A	NR-3359	W Hardie	11/18/96	DRAWN W Robinson	11/04/92
FRACTIONS DECIMALS ANGLES				-	B	01-6667	D Teeter	09/06/94	CHECK P Duran	07/24/97
± .XX ± .XXX ±				LSL	C	01-7954	R Haugen	07/24/96	ENGR W Hardie	11/18/92
DO NOT SCALE DRAWING				RJ	D	01-8588	R Haugen	07/30/97	PROD C Lee	11/19/92
MATERIAL									QA T McDowell	11/20/92
FINISH									MAT C Thompson	11/20/92
									ACCT	
				REQ. (CURRENT REV.)			B Quinn	07/25/97		

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

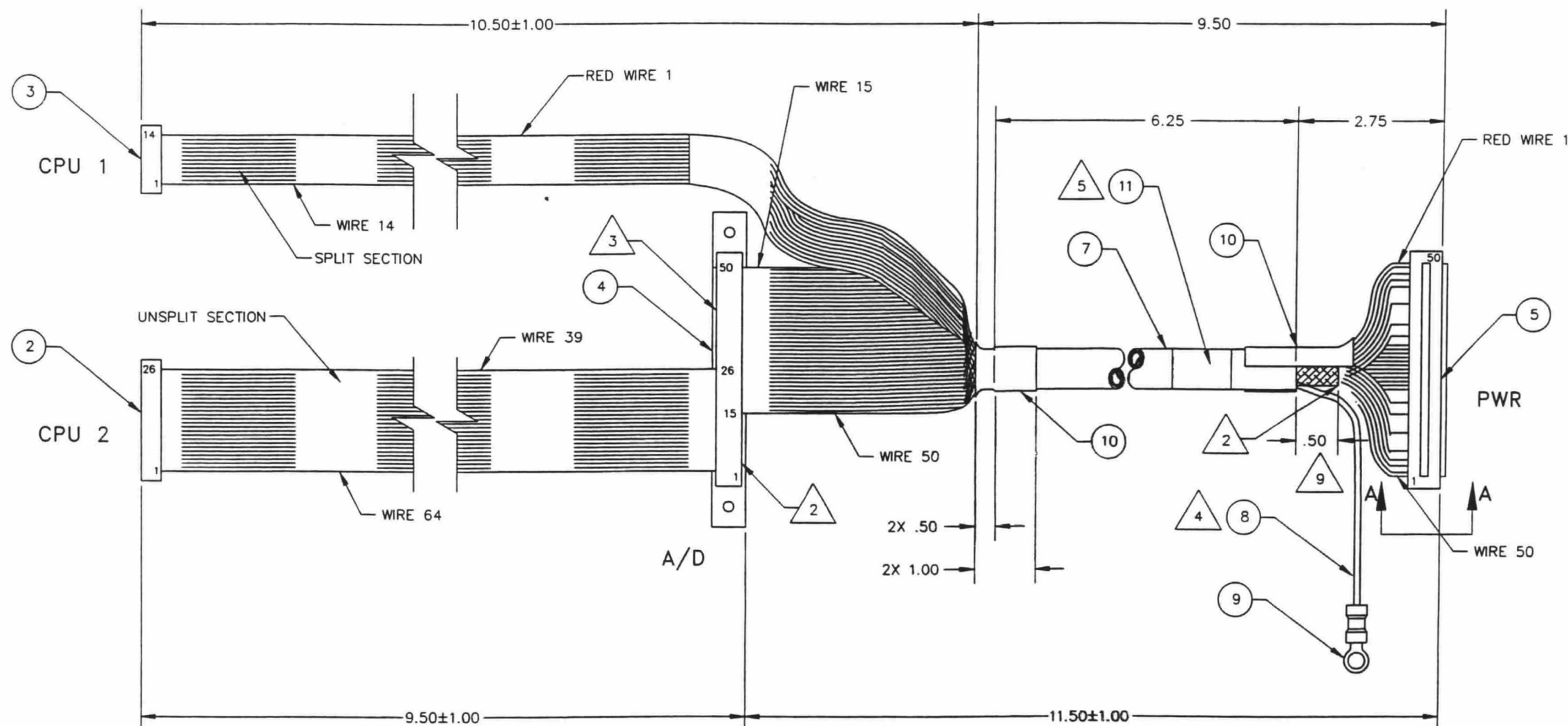
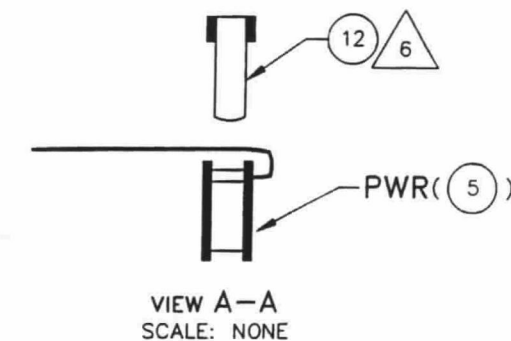
37 ASSEMBLY DRAWING  
CABLE, A/D-PHOTOBOARD

SIZE B DWG. NO. 9900-1837 REV. D

SCALE NONE DWG. FILE TYPE 9000-02258 AutoCAD SHEET 1 OF 1

# NOTES: (UNLESS OTHERWISE SPECIFIED)

1. USE PARTS LIST NO. 9800-2386
2. CUT OFF WIRES 51 THROUGH 64.
3. CUT OFF WIRES 15 THROUGH 38.
4. SOLDER WIRE TO SHIELDING.
5. APPLY LABEL WITH CURRENT MICROSCAN PART NUMBER, CURRENT REVISION, SUPPLIER ID AND DATE.
6. INSTALL ITEM (12) ON ITEM (5) AS SHOWN.
7. PIN 1 OF CONNECTORS IS NOT SAME AS PIN 1 (RED WIRE) OF CABLE.
8. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.
9. DIMENSION IS FOR MANUFACTURING ONLY.
10. CONTINUITY CHECK IS REQUIRED.



INCHES				IMP.	REV.	EDH/WR	APPROVAL	DATE	APPROVAL	DATE	
TOLERANCES ARE: FRACTIONS    DECIMALS    ANGLES ± ---- .XX±.50 ± --- .XXX± ----  DO NOT SCALE DRAWING				DVF	A	WR-5194	R Haugen	12/11/95	DRAWN	R Haugen	12/11/95
				DVF	B	01-7488	R Haugen	01/25/96	CHECK	R Haugen	12/08/95
				DVF	C	01-7676	B Dahlwal	03/18/96	R/D	R Haugen	12/11/95
				DVF	D	01-7722	B Dahlwal	05/01/96	ME/PE	R Haugen	12/11/95
MATERIAL  ---				PLD	E	01-8175	R Haugen	11/18/96	QA	M Stannius	12/11/95
				RJ	F	01-8687	R Haugen	07/30/97	MAJ	C Lockhart	12/11/95
				PLD	G	01-9272	K Wang	07/10/98	ACCT	N/A	N/A
FINISH  ---				PLD	H	01-9443	C Her	12/08/98			
REQ. (CURRENT REV.)							C Her	12/08/98			

<b>DADE BEHRING</b> Dade MicroScan Inc. West Sacramento, CA 95691 USA			
ASSY DWG, CABLE, A/D INTERFACE, AS-4			

SIZE	DWG. NO.	REV.
C	9900-2386	H
SCALE 1:1	DWG FILE TYPE 9900-0227E	AutoCAD
SHEET 1		OF 1

**DADE BEHRING**  
Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

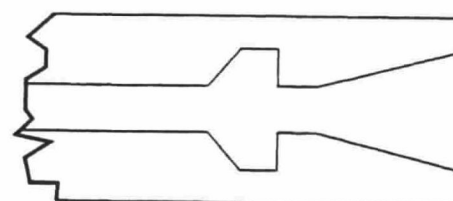
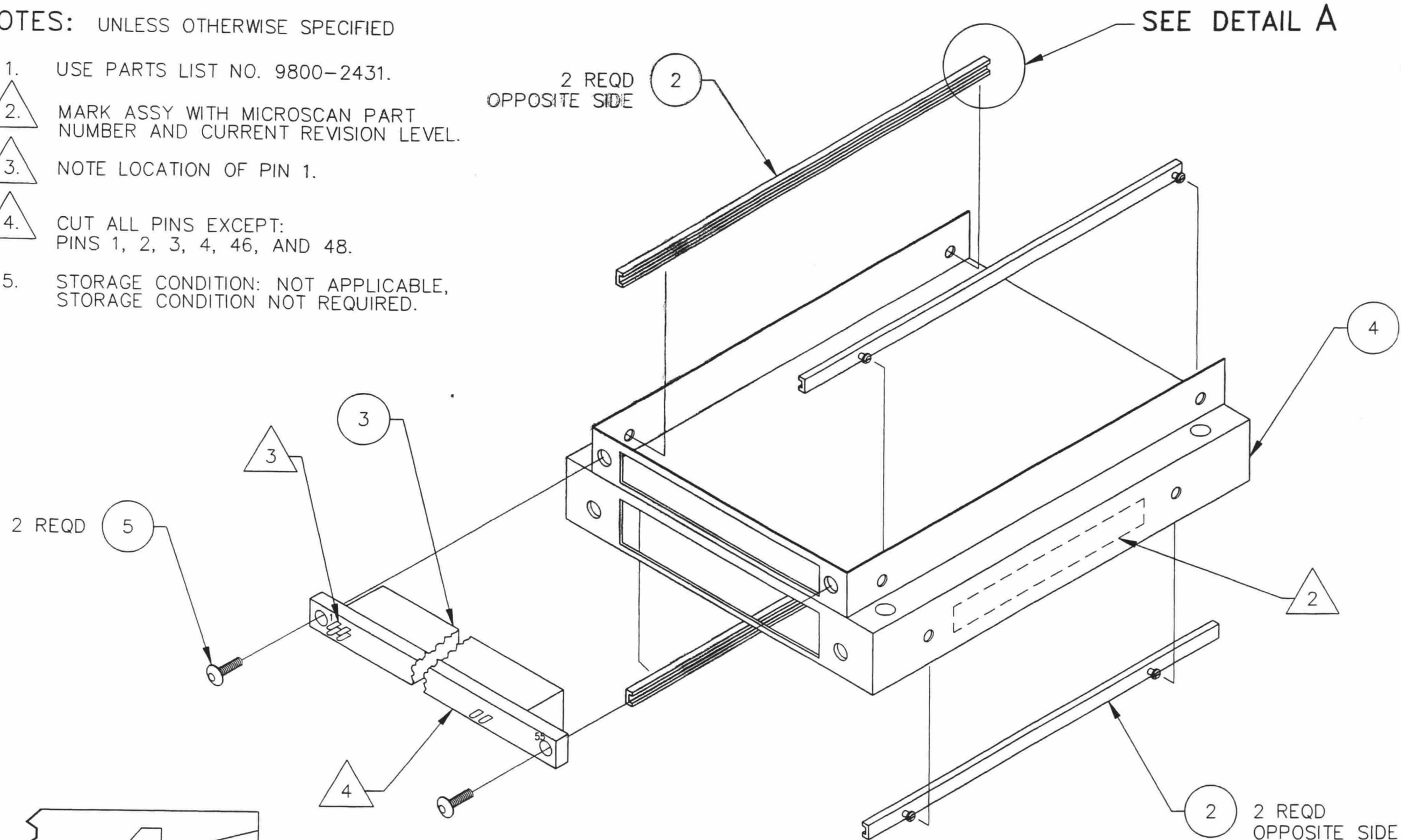
ASSY DWG, CABLE, A/D  
INTERFACE, AS-4

SIZE	DWG. NO.	REV.
C	9900-2386	H
SCALE 1:1	DWG. FILE TYPE 9900-0227C	SHEET 1 OF 1



# NOTES: UNLESS OTHERWISE SPECIFIED

1. USE PARTS LIST NO. 9800-2431.
2. MARK ASSY WITH MICROSCAN PART NUMBER AND CURRENT REVISION LEVEL.
3. NOTE LOCATION OF PIN 1.
4. CUT ALL PINS EXCEPT: PINS 1, 2, 3, 4, 46, AND 48.
5. STORAGE CONDITION: NOT APPLICABLE, STORAGE CONDITION NOT REQUIRED.



DETAIL A

INCHES				IMP.	REV.	ECH/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				DVP	A	WR-5335	R Haugen	02/13/96	DRAWN D Pesenti	02/06/96
FRACTIONS				DVP	B	01-7634	R Haugen	03/13/96	CHECK W Robinson	02/07/96
DECIMALS				RJ	C	01-8728	R Haugen	08/12/97	ENGR R Haugen	02/13/96
ANGLES									PROD R Haugen	02/13/96
± 1/64									QA M Stannius	02/14/96
.XX ± .50 ± 1/2"									MAT C Lockhart	02/13/96
.XXX ± .005									ACCT	
DO NOT SCALE DRAWING										
MATERIAL										
---										
FINISH										
---										
REQ. (CURRENT REV.)							C Dryer	08/13/97		

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

ASSY DWG, BRACKET,  
CPU A/D MOUNT, AS-4

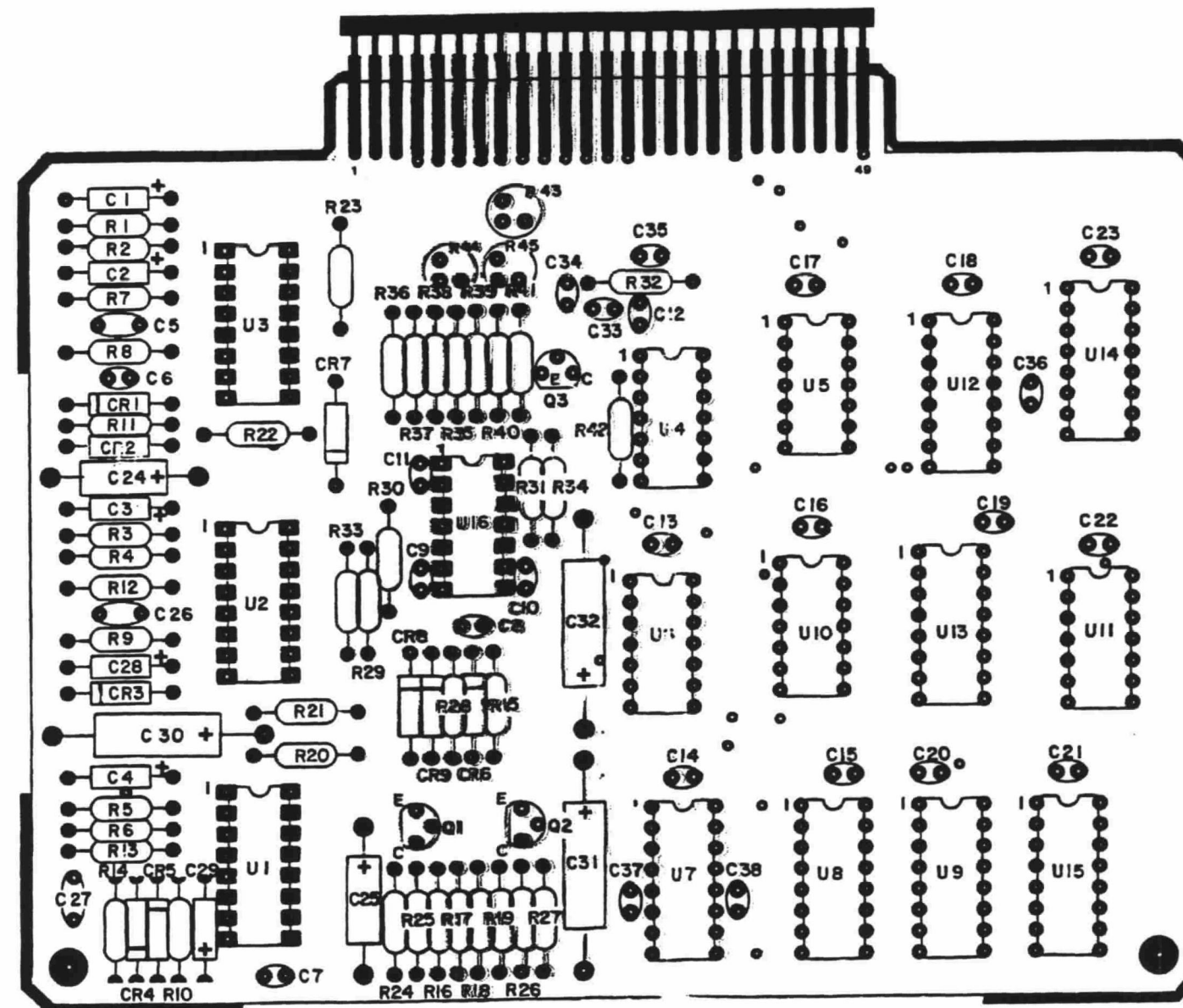
SIZE B DWG. NO. 9900-2431 REV. C

SCALE NONE DWG. FILE TYPE 9900-02258 AutoCAD SHEET 1 OF 1



REV	DESCRIPTION	DATE	APPROVED
E	RENUMBERED TO 4230-XXXX SERIES REF ECR 1-419	6-1-83	KM
F	MODIFIED BY ECR#1-472	8-22-87	KH
G	REF: PER ECR#1-0599	9-21-87	KN
H	REV. VIA ECN# 01-2303	4-10-90	KM
J	REV. PER ECN# 01-5208	7-24-90	KH
K	REV. PER ECN 01-7954	7-24-90	KH
L	01-8779	8-5-97	RJ

ASSY  
COMPONENT SIDE



ITEM	REF. DES.	ITEM	REF. DES.
1	U1 - U3	28	R12 - R13
2	U4 - U5	29	R14 - R19
3	U6	30	R20 - R22
4	U7	31	R23
5	U8 - U9	32	R24
6	U10 - U11	33	R25
7	U12	34	R26
8	U13 - U15	35	R27
9	U16	36	R28 - R32
10	Q1 - Q3	37	R33 - R35
11	CR1 - CR6	38	R36, R38, R4
12	CR7 - CR9	39	R37, R39, R4
13	C1 - C4	40	R42
14	C5	41	R43 - R45
15	C6 - C23		
16	C24 - C25		
17	C26 - C27		
18	C28 - C29		
19	C30 - C31		
20	C32		
21	C33 - C36		
22	C37		
23	C38		
24	R1 - R6		
25	R7		
26	R8 - R10		
27	R11		

REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
U	U16	—	I.C.
Q	Q3	—	TRANSISTOR
CR	CR6	—	DIODE
C	C38	—	CAPACITOR
R	R43	—	RESISTOR

- NOTE:
1. THIS DWG. IS TO BE USED IN CONJUNCTION WITH BOM 4220-0012.
  2. STORAGE CONDITION: PROTECT FROM ELECTROSTATIC DISCHARGE.

UNCLASSIFIED INFORMATION		CONTRACT NO.	
FUNCTIONAL SYMBOLS		DATE	
DWG		9-83	
APPROVED		9-83	
C		4230-0012	
BOULE 2		SHEET 1 OF 1	

**DADE** Data Management Inc.  
PC BOARD ASSY,  
CONTROLLER, AS-4

1. DO NOT INSTALL EJECTOR LATCHES, ITEM (47), UNTIL AFTER PCB HAS BEEN TESTED ON THERMAL CYCLE TESTER.

2. UI (IO, BUFFER) NOT INSTALLED.

2

U1 (IC, BUFFER) NOT INSTALLED.

3

46

48

45

100  
6PL

1 47  
2 PL.

52  
2 PL.

REV.

REV.

3. PLACE SPARKERS, ITEM (10), ON LEADS FOR LOCATION L2, L2 AND L3.

4. STORAGE CONDITIONS: PROTECT FROM ELECTROSTATIC DISCHARGE.

M	REV PER FCN# 01-5795	5/7/93	
N	REV PER FCN 01-7954	7-31-93	214
P	1-8779		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	E	REF ECR 4-013	7-10-85	gnt
	F	RENUMBERED / ECR 1-419	6-19-87	mt-
	G	REF ECR #1-471	7-22-87	kt
	H	REF PER ECR #01-0813	2-24-88	AMC
	J	REV. VIA ECR #01-1611	4-1-89	5 AG
	K	REV PER ECR #01-5333	4-9-82	200
	L	REV. PER ECR #01-5685	7-7-87	200

ITEM	REF. DES.	ITEM	REF. DES.
②	U1	26	R7-R9
2	U2, U3	27	R10
3	U4	28	R11
4	U5	29	R12
5	U6	30	R13, R14
6	U7	31	R15, R16
7	U8	32	R17
8	U9	33	R18
9	U10	34	R19, R20
10	U11	35	R21-R26, R29, R30
11	CR1, CR2	36	R27, R35
12	L1-L3	37	R28
13	C1-C20	38	
14	C21, C22	39	R31, R32
15	C23	40	R33, R34
16	C24	41	
17	C25-C28	42	R36
18	C29	43	J1
19	C30-C32	44	J2
20	C33		
21	C34-C36		
22	C37		
23	R1, R2		
24	R3, R4		
25	R5, R6		

REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
U	U11	—	I.C.
R	R36	—	RESISTOR
C	C36	—	CAPACITOR
L	L3	—	INDUCTOR
J	J2	—	CONNECTOR

THIS DRAWING SPECIFICALLY IDENTIFIES THE FOLLOWING DRAWING OR DRAWINGS AS BEING THE PROPERTY OF:		CONTRACT NO.		<b>DADE</b>		Dade MicroScan Inc. 701 Sacramento, CA 95811 USA	
DRAWING OR DRAWINGS ANALYZED BY:		APPROVALS		DATE		P C BOARD ASSY, A/D, AS - 4	
DATE:		DWG		8-83		SCALE	
DRAWING NO.		APPROVED		10-83		DRAWING NO.	
DATE:		DATE		10-83		4230-0015	
DRAWING NO.		DATE		10-83		P	
DATE:		DATE		10-83		SCALE	
DRAWING NO.		DATE		10-83		SHEET	
DATE:		DATE		10-83		OF	
DRAWING NO.		DATE		10-83		2:1	
DATE:		DATE		10-83		2:1	
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DRAWING NO.		DATE		10-83		2:1	
DATE:		DATE		10-83		2:1	
DRAWING NO.		DATE		10-83		2:1	
DATE:		DATE		10-83		2:1	





NOTES: (CONTINUED)  
9. STORAGE CONDITIONS: PROTECT FROM  
ELECTROSTATIC DISCHARGE.

P	REV. PER ECN 01-7754	1-24-90	24
Q	REV. PER ECN 01-8779	8-3-97	31
R	REV. PER ECN 01-9034		

N	REV. PER ECN 01-7462	1-24-90	24
---	----------------------	---------	----

NOTES (CONTINUED):

5. POSITION ITEMS (50), (51), (52) WITH  
PIN 1 LOCATED NEXT TO THE BOARD  
EDGE.

6. LEADS 4, 5, 12, 13 OF SOCKETS ARE TO BE  
PULLED OUT PRIOR TO INSERTION OF SOCKET  
INTO THE PCB. VISUALLY VERIFY AT LEAST  
.025" BETWEEN THESE PINS AND  
THE PCB.

HAND SOLDER AT 700°F.

8. UNUSED PART: C33, R63

REV.	DESCRIPTION	DATE	APPROVED
A	PRODUCTION RELEASE. ECR 1-0256	1-15-88	A.M.C.
B	REF. ECN 01-0646		
C	REV. VIA ECN #01-1677	5/16/87	S.A.G.
D	REV. VIA ECN #01-1724	5-30-81	A.M.C.
E	REV. VIA ECN #01-2406	6/10/80	S.A.G.
F	REV. VIA ECN #01-3558	11-16-71	S.A.G.
G	REV. VIA ECN #01-3761		
H	REV. PER ECN #01-4369		
J	REV. PER ECN #01-4541		
K	REV. PER ECN #01-5861		
L	REV. PER ECN #01-6272		
M	REV. PER ECN 01-3862		

ITEM	REF. DES.
6	U3
7	U4
8	Q1-Q9
9	Q10, Q11
10	Q12, Q20
11	Q13, Q14
12	Q15
13	Q16-Q19
14	CR1-CR17
15	CR18-CR20
16	CR21-CR23
17	L1-L4
18	L5
19	L6
20	C1-C5
21	
22	C6
23	C7-C15, C29
24	C16-C22
25	C23-C25
26	C26-28, 30-32
28	C34
29	R1-R10
30	R12, R13
31	R14-R16
32	R17-R19
33	R20-R22
34	R23-R24
35	R25-R26
36	R27-R30

ITEM	REF. DES.
37	R31
38	R32
39	R33
40	R34
41	R35
42	R36-R38
43	R39-R40, R43-R50
44	R51-R56
45	R57
46	R41, R42, R58
47	R59
49	J1
50	J2
51	J3
52	J5
53	J7
55	J4
56	TP1-TP11
68	R11
73	C40
74	R61
75	CR24
79	F5
80	F4
81	F3
82	F1, F2
87	R62, R64
88	R63
97	UL1, UL2

SEE SEPARATE PARTS LIST 4220-0051

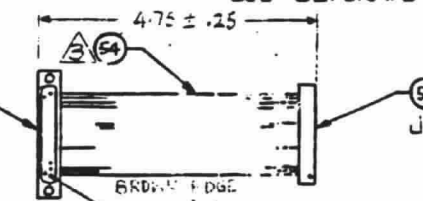
NOTE: UNLESS OTHERWISE SPECIFIED,

1. USE TRANSISTOR MOUNTING FIXTURE TO HOLD  
Q1-Q9, Q11-Q14 AND Q20 IN PLACE FOR  
DRAG SOLDERING.

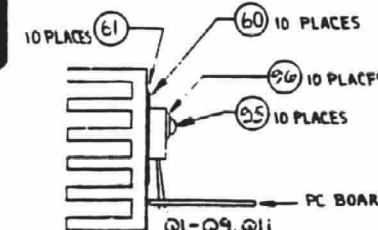
2. APPLY LIQUID SOLDERMASK ON THE SOLDER  
SIDE AT J4 AND AT WIRE LOCATIONS FOR  
R62-R64.

3. REMOVE CONDUCTOR LEAD (BLUE WIRE)  
FROM ITEM 54 BEFORE INSERTING  
INTO ITEM 55 (J7).

4. INSTALL SPACER (1) TO RESISTOR WITH  
1 WATT AND ABOVE RATING.



DETAIL A  
SCALE: ACTUAL



REV. ASSY	USED 0-4
APPLICATION	DO NOT SCALE DRAWING

QTY	FROM	REQD.	NO.	USED
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTION, DECIMALS, AND .01				
MATERIAL	FINISH	OVERCOAT	REWORK	REWORK

APPROVALS	DATE
T3L	8-15-86
	12/14/97

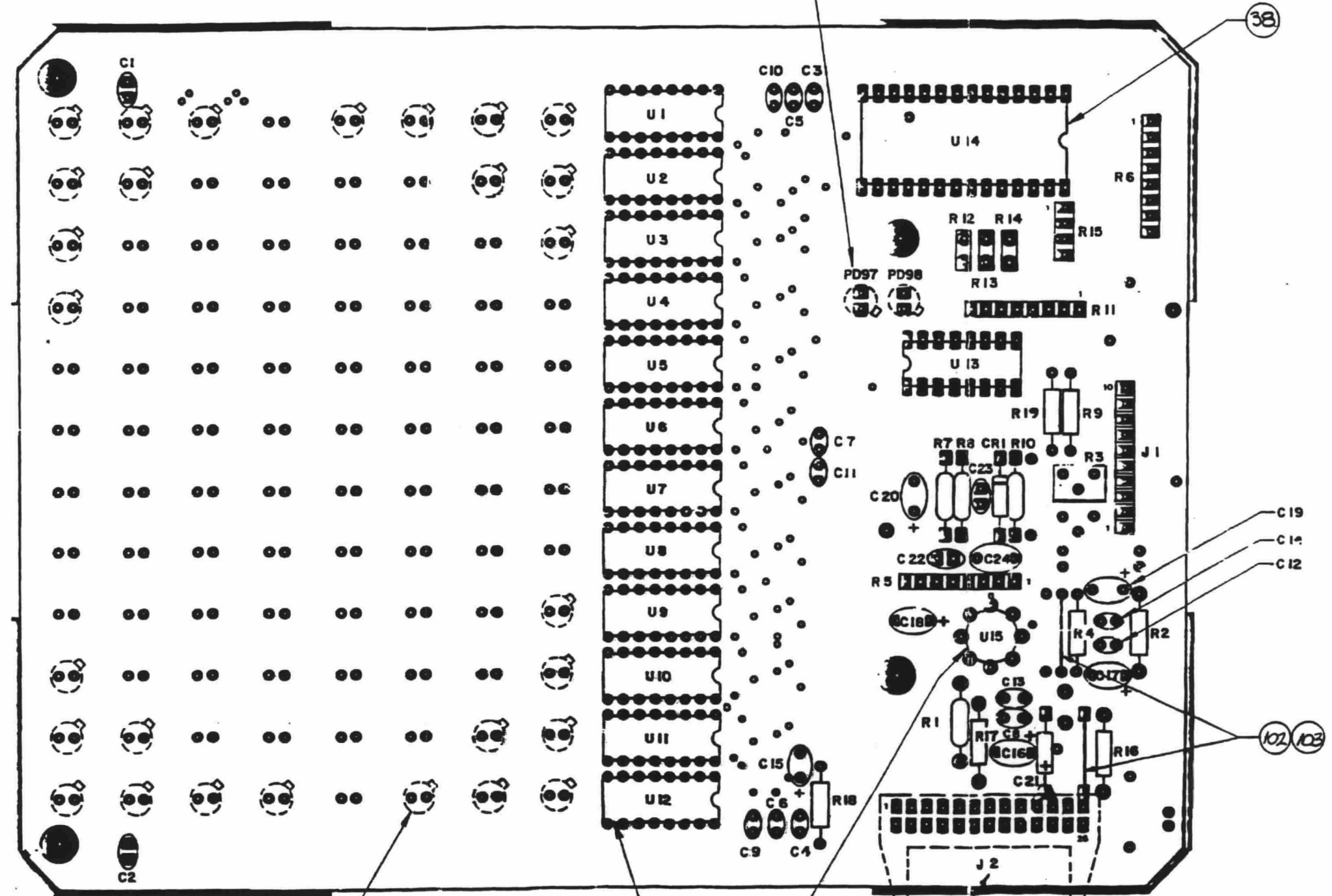
DADE Dade MicroSeal Inc. 1000 S. Bascom Ave. Suite 100 San Jose, CA 95128 USA	
PCB ASSEMBLY DRAWING POWER BOARD, UL APPROVED	
SIZE FROM NO.	DWG. NO.
D	4230-0051
SCALE 2/1	SHEET 1 of 1

4230-0051

REFERENCE DESIGNATION TABLE				L REV. PER ECN 01-7954		7-24-90 RW		F REV. PER ECN# 01-2325		4-23-90 EBN		REVISIONS				
SYMBOL	HIGHEST	UNUSED	DESCRIPTION					G REVISED VIA ECN 01-2421		5-18-90 EBN		ZONE	LTR	DESCRIPTION	DATE	APPROVED
U	U15	—	I. C.					H REV PER ECN # 01-4018		9-17-91 RW			A	REF ECR 1-350	2/21/87	JF
R	R19	—	RESISTOR					J REV. PER ECN# 01-4922		3-17-92 TS			B	REF ECN 01-0698	11-13-87	AMC
C	C24	C2	CAPACITOR					K REV. PER ECN# 01-6734		10-31-91 SZ LL			C	REF ECN 01-749	1-13-88	AMC
PD	PD98	—	PHOTO DIODE					ASSY					D	REF ECN 01-0787	3-9-88	AMC
CR	CR1	—	DIODE					COMPONENT SIDE					E	REF ECN# 01-1611	4/14/89	SAG
J	J2	—	CONNECTOR													

ASSY  
COMPONENT SIDE

ITEM	REF. DES.
1	U1-U13
2	U14
3	U15
4	CR1
5	PD1-PD98
6	C1, C3-C14
7	C15-C17
8	C18-C20
9	C21
10	C22-C23
11	C24
12	R1-R2, R16-R18
13	R3
14	R4
15	R5, R6
16	R7
17	R8
18	
19	R9
20	R19
21	R11
22	R12
23	R13
24	R14
25	R15
26	J1
27	J2
39	R10

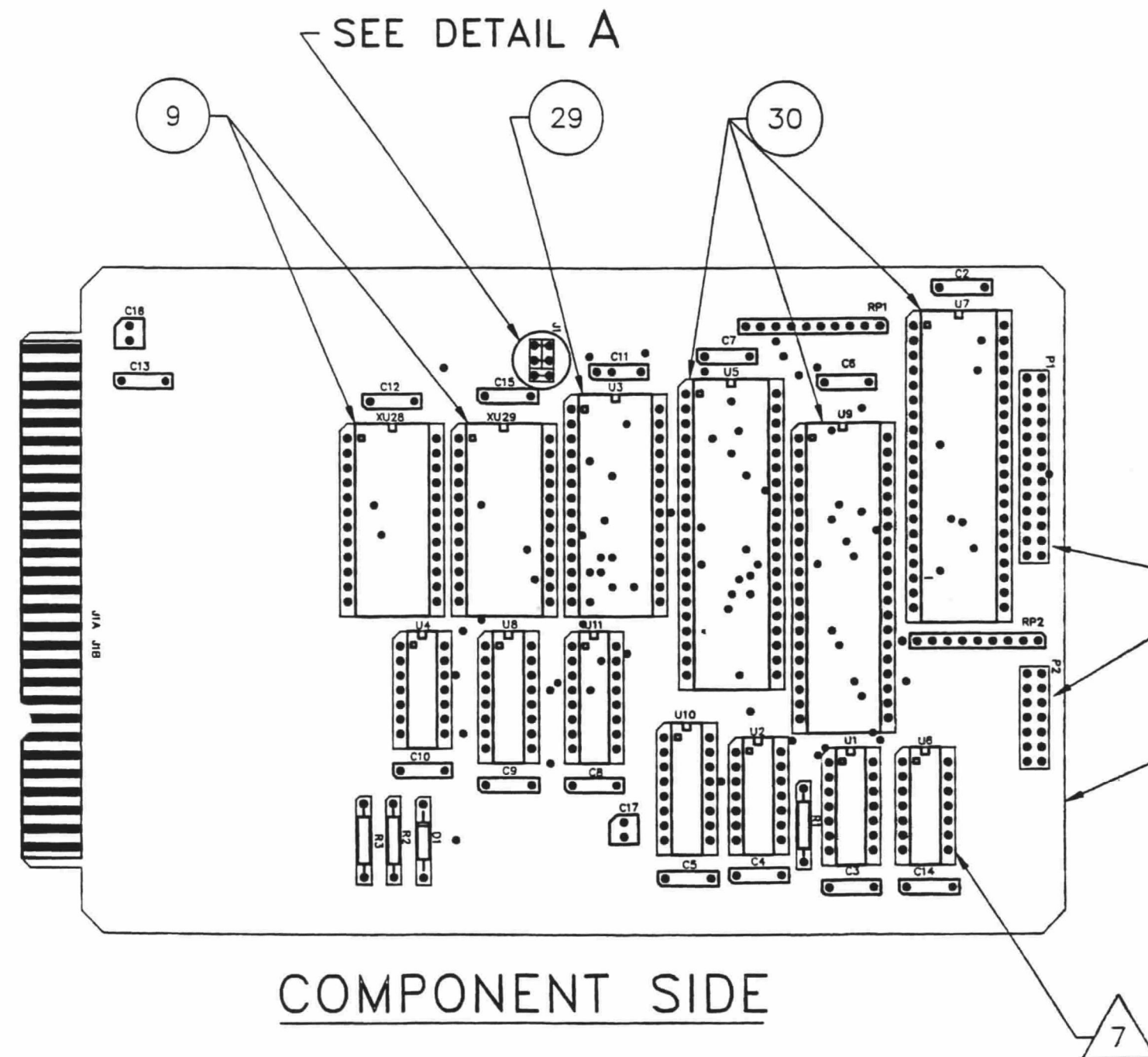


NOTES:

1. ITEM 5 MUST BE HAND SOLDERED.
2. USE A TEMP CONTROLLED SOLDERING IRON WITH DIGITAL READ OUT SET TO 700°C FOR ALL PHOTO DIODES.
3. DO NOT INSTALL ITEM (27) PRIOR TO TERADYNE TEST. INSTALL ITEM (27) AFTER TERADYNE TEST, BEFORE FUNCTIONAL TEST.

DADE		F.C BOARD ASSY, PHOTO DIODE, AS-4	
DATE	5-28	REV	1-2
BY	7/14/87	CHK	
C	4230-0059		





## COMPONENT SIDE

REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
R	R3	—	RESISTOR
RP	RP2	RP1, RP2	RESISTOR PACK
C	C17	—	CAPACITOR
D	D1	—	DIODE
XU	XU29	XU1-XU27	EPROM
J	J1	—	JUMPER
U	U11	—	IC
P	P2	—	CONNECTOR

DETAIL A  
SCALE: 4/1

ITEM NO.	REFERENCE DESIGNATION
3	R2
4	R3
5	R1
6	C16, C17
7	C2-C15
8	D1
12	J1, P1, P2
13	U1
14	U2
15	U3
16	U4
17	U5
18	U6
19	U7
20	U8
21	U9
22	U10
23	U11
32	XU28, XU29

### NOTES: UNLESS OTHERWISE SPECIFIED

- USE PARTS LIST 4220-0098.
- FOR FURTHER ASSY INSTRUCTIONS USE ASSEMBLY PROCEDURE ITEM 27.
- SOLDER ITEM 25 NOT SHOWN.
- CUT ITEM 12 INTO PIECES TO FIT J1 (6 PINS), P1 (26 PINS) AND P2 (14 PINS).
- REMOVED
- PUT COMPLETED ASSY INTO ANTI-STATIC BAG  
ITEM 26 NOT SHOWN.
- PIN # 1 OF U6 MAY BE INDICATED BY A SQUARE CORNER.
- STORAGE CONDITION: PROTECT FROM ELECTROSTATIC DISCHARGE.

INCHES				IMP.	REV.	EDR/WR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				D	01-5943	D Carr	07/19/93	DRN	P Kuhl	03/08/90
FRACTIONS DECIMALS ANGLES				E	01-6035	D Carr	08/13/93	DRN	R Kiosinski	06/18/90
± .XX ± .XX ± .XX ±				F	01-6105	D Carr	09/23/93	DRN	R Kiosinski	06/18/90
DO NOT SCALE DRAWING				G	01-6891	D Carr	01/24/95	DRN	H Maleknia	06/19/90
MATERIAL				H	01-6833	R Haugen	03/02/95	DRN	C Van Pelt	06/19/90
FINISH				J	01-7954	R Haugen	07/24/96	DRN	J Nicholas	06/20/90
PLD				K	01-8779	R Haugen	08/14/97	DRN		
REV. (CURRENT REV.)										

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

44 ASSEMBLY DRAWING  
PCB, AS-4 CPU II

SIZE DWG. NO.  
B 4230-0098

SCALE 1:1 DWG. FILE TYPE AutoCAD SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

1. DRAWING TO BE USED IN CONJUNCTION WITH B.O.M. 4220-0186.

2. PHOTO DIODES, ITEM (5), SHALL BE HAND SOLDERED AT 700°C.

3. INSTALL ITEM (27) AFTER TERADYNE TEST, BEFORE FUNCTIONAL TEST.

4. USING A SCRIBER, SCRIBE SERIAL NUMBER ON THE COMPONENT SIDE OF THE BOARD.

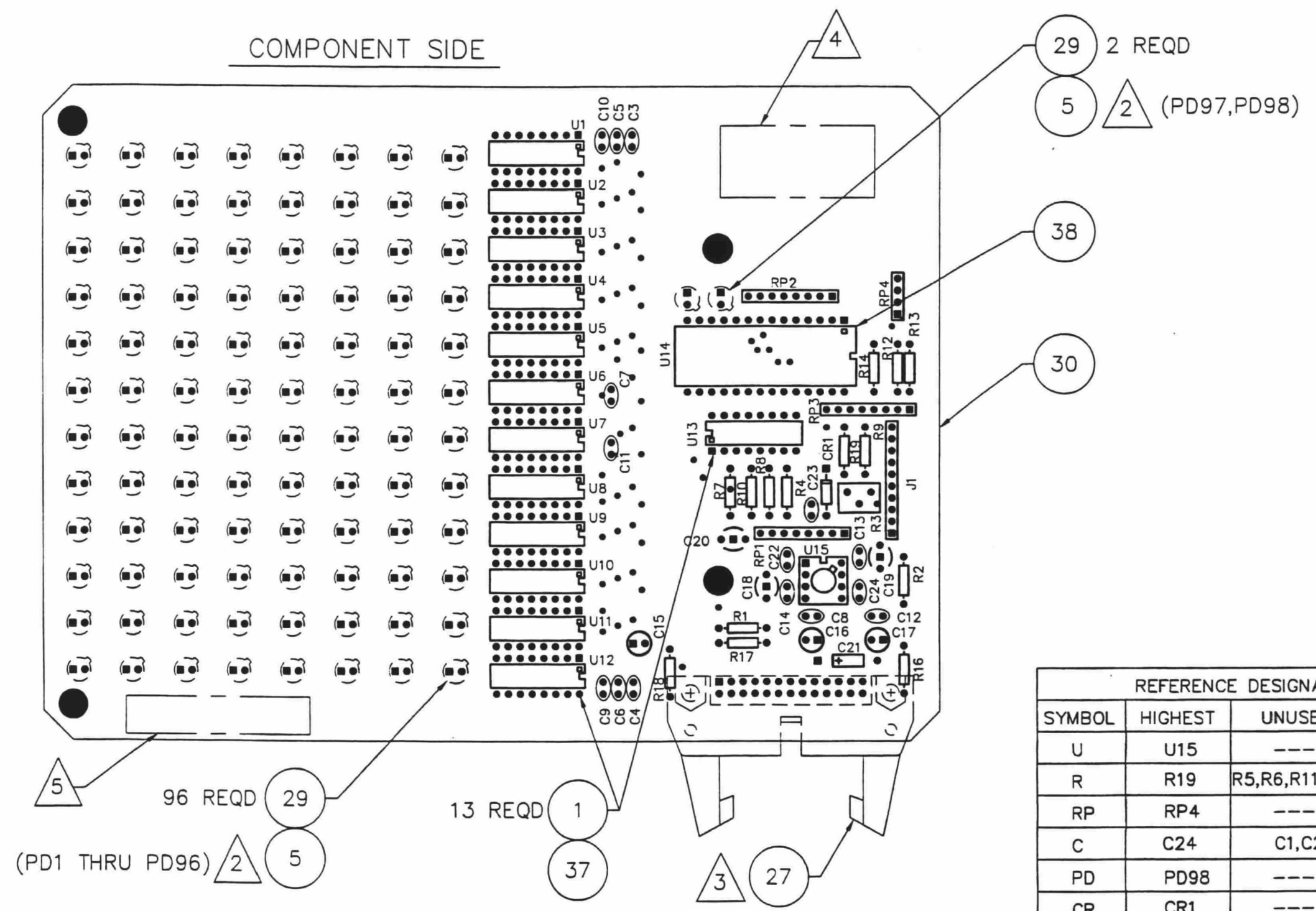
5. USING A PERMANENT MARKER, MARK COMPLETED BOARD WITH THE ASSEMBLY NUMBER (IF MISSING OR INCORRECT ON THE PCB) AND CURRENT REVISION LEVEL, ON COMPONENT SIDE OF THE BOARD, AND PLACE IN BAG ITEM (97).

6. STORAGE CONDITION: PROTECT FROM ELECTROSTATIC DISCHARGE.

INCHES		REV.	ECO/REV	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:		WCR	A	5034	B Singh	11/22/95	DRAWN W Robinson 11/17/95
FRACTIONS DECIMALS ANGLES		DVP	B	01-7530	B Dhallwal	02/05/96	CHECK D Pesenti 11/22/95
± .XX± ± .XXX±		PLD	C	01-8779	R Haugen	08/05/97	ENGR B Singh 11/22/95
DO NOT SCALE DRAWING		PLD	D	01-8941	R. H. Singh	10-1-97	PROD B Singh 11/22/95
MATERIAL							QA M Stannius 11/22/95
FINISH							MAT C Lockhart 11/22/95
							ACET
		REQ. (CURRENT REV.) R. H. Singh 9/30/97					

<b>DADE</b> Dade MicroScan Inc. West Sacramento, CA 95691 USA	
47 ASSEMBLY DRAWING PHOTO BOARD II	
SIZE B	DWG. NO. 4230-0186
SCALE NONE	REV. D
DWG. FILE TYPE 9009-02238 AutoCAD	
SHEET 1 OF 2	

COMPONENT SIDE



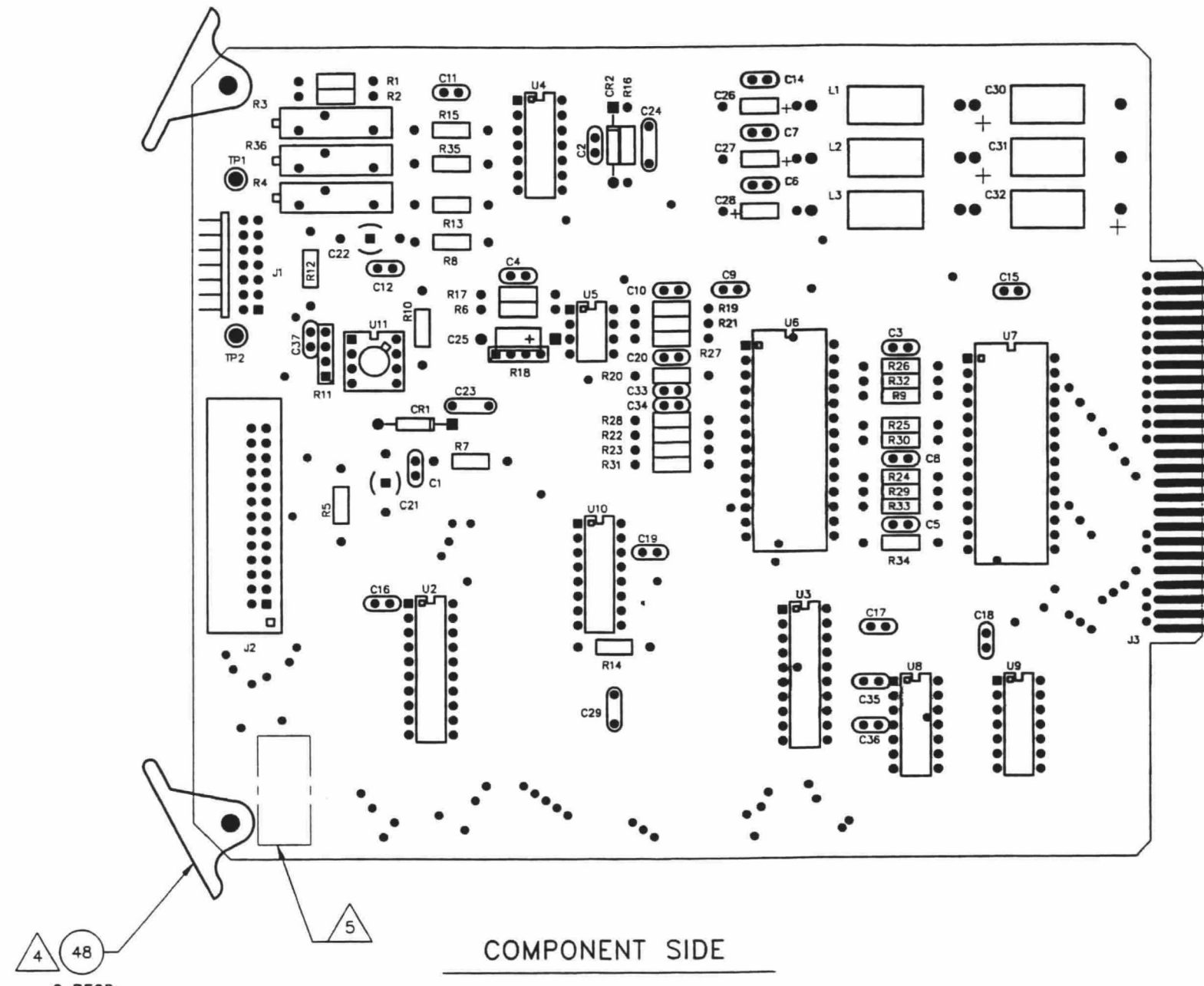
REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
U	U15	---	I.C.
R	R19	R5,R6,R11,R15	RESISTOR
RP	RP4	---	RESISTOR PACK
C	C24	C1,C2	CAPACITOR
PD	PD98	---	PHOTO DIODE
CR	CR1	---	DIODE
J	J2	---	CONNECTOR

ITEM	REF. DESIGNATOR
1	U1-U13
2	U14
3	U15
4	CR1
5	PD1-PD98
6	C3-C14
7	C15-C17
8	C18-C20
9	C21
10	C22,C23
11	C24
12	R1,R2,R16-R18
13	R3
14	R4
15	RP1,RP2
16	R7
17	R8
18	---
19	R9
20	R19
21	RP3
22	R12
23	R13
24	R14
25	RP4
26	J1
27	J2
28	R10

**DADE** Dade MicroScan Inc.  
West Sacramento, CA 95691 USA

418 ASSEMBLY DRAWING  
PHOTO BOARD II

SIZE B	DWG. NO. 4230-0186	REV. D
SCALE NONE	DWG. FILE TYPE 9008-0228A	SHEET 2 OF 2



- NOTES: UNLESS OTHERWISE SPECIFIED
- 1. DRAWING TO BE USED IN CONJUNCTION WITH B.O.M. 4220-0188.
  - 2. PLACE SPACER, ITEM (53), ON LEADS FOR LOCATION L1, L2, AND L3.
  - 3. INSTALL IC ITEM (10) ONTO SOCKET ITEM (52), IN LOCATION U6. INSTALL IC ITEM (11) ON SOCKET ITEM (52), IN LOCATION U7.
  - 4. DO NOT INSTALL EJECTOR LATCHES, ITEM (48), UNTIL AFTER PCB HAS BEEN TESTED ON TERADYNE TESTER.
  - 5. USING A SCRIBER SCRIBE SERIAL NUMBER, ASSEMBLY NUMBER AND CURRENT REVISION LEVEL ON THE BOARD.
  - 6. STORAGE CONDITION: PROTECT FROM ELECTROSTATIC DISCHARGE.

ITEM	REF. DESIGNATOR	ITEM	REF. DESIGNATOR
7	U2,U3	28	R3,R4
8	U4	29	R36
9	U5	30	R1,R2
10	U6	31	R5,R6
11	U7	32	R7-R9
12	U8	33	R10
13	U9	34	R11
14	U10	35	R12
15	U11	36	R13,R14
16	CR1,CR2	37	R15,R16
17	L1-L3	38	R17
18	C1-C12,C14-C20	39	R18
19	C21,C22	40	R19,R20
20	C23	41	R21-R26,R29-R30
21	C24	42	R27,R35
22	C25-C28	43	R28
23	C29	44	R31,R32
24	C30-C32	45	R33,R34
25	C33	46	J1
26	C34-C36	47	J2
27	C37		

REFERENCE DESIGNATION TABLE			
SYMBOL	HIGHEST	UNUSED	DESCRIPTION
R	R36	---	RESISTOR
C	C37	C13	CAPACITOR
U	U11	U1	I.C.
J	J3	---	HEADER
CR	CR2	---	DIODE
L	L3	---	INDUCTOR
TP	TP2	---	TEST POINT

INCHES				IMP.	REV.	ENH/MR	APPROVAL	DATE	APPROVAL	DATE
TOLERANCES ARE:				WCR	80	NR-5388	B Dholiwal	05/03/96	DRAWN W Robinson	03/28/96
FRACTIONS DECIMALS ANGLES				LSL	100	NR-5802	S Dohermann	10/09/96	CHECK J Westlake	10/23/96
± .XX ± .XXX ± .XXX ±				LSL	A	01-8521	B Dholiwal	05/05/97	ENGR S Dohermann	10/11/96
DO NOT SCALE DRAWING									PROD S Dohermann	10/09/96
MATERIAL									QA R Cortero	10/01/96
FINISH									MAT C Lockhart	10/10/96
									ACCT	

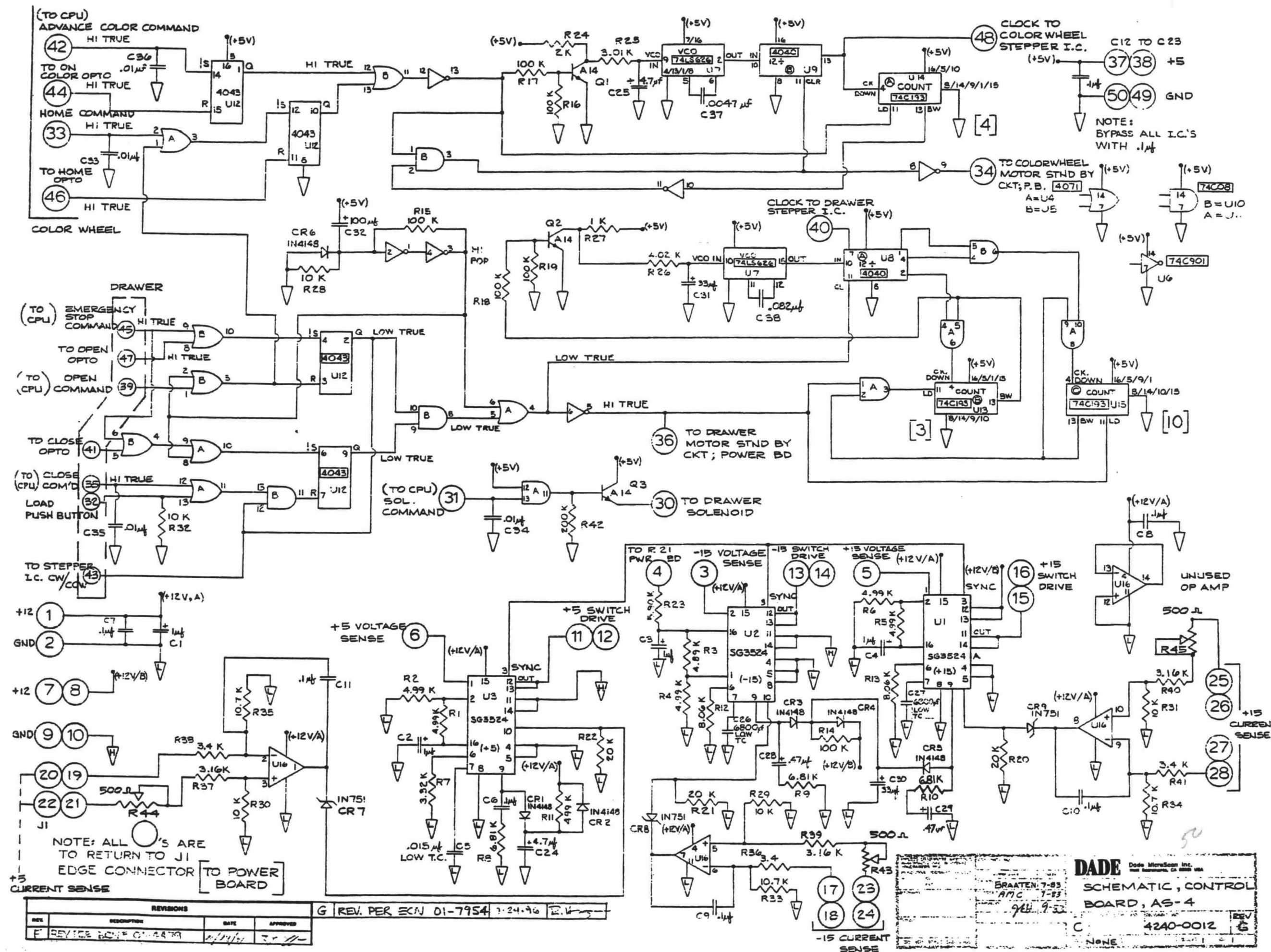
**DADE** DADE MicroScan Inc.  
West Sacramento, CA 95691 USA

49 ASSY DWG,  
AS-4 A/D BOARD II

SIZE B DWG. NO. 4230-0188

SCALE NONE DWG FILE TYPE 9008-0223A AutoCAD SHEET 1 OF 11





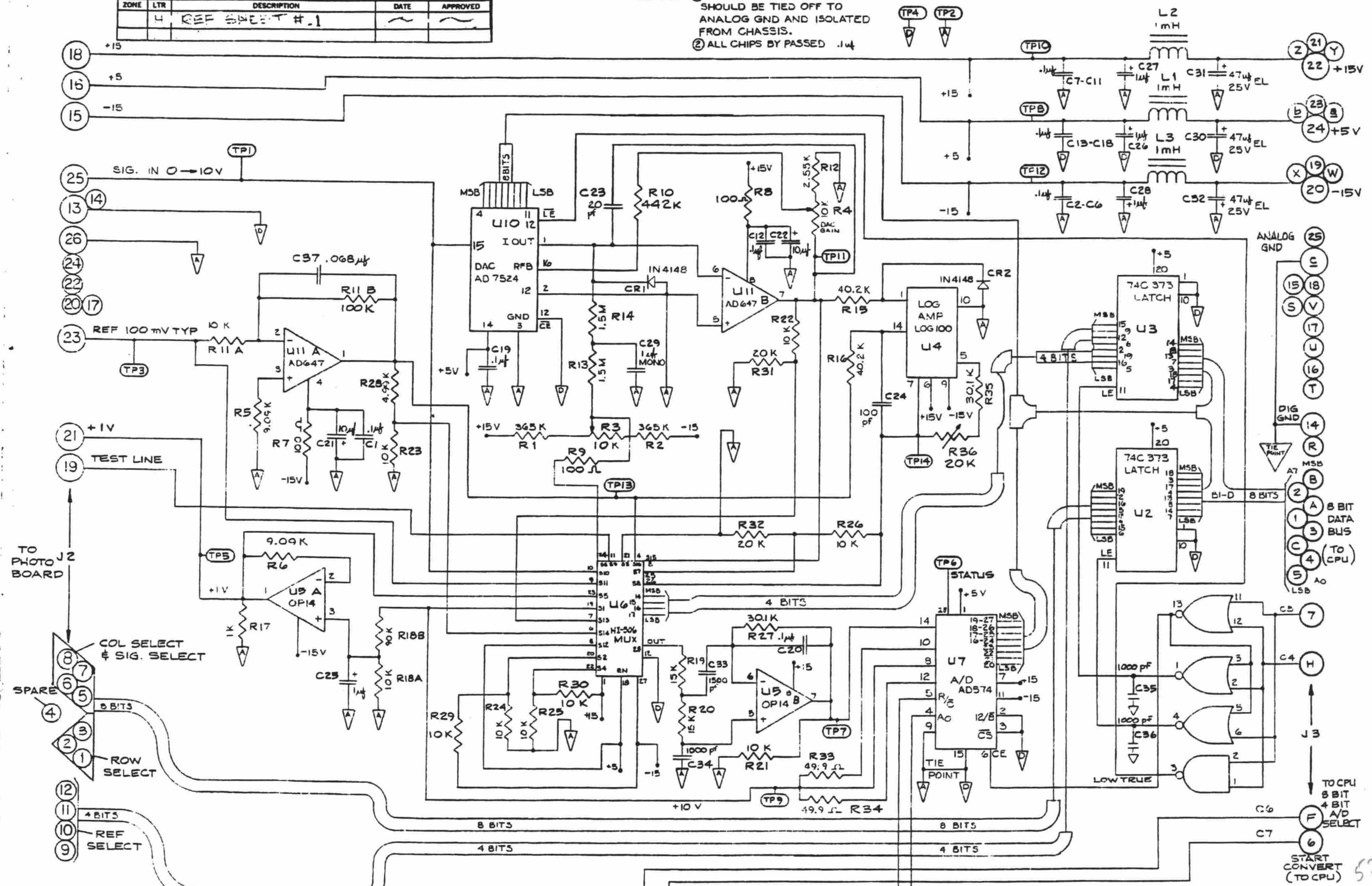


ZONE	REV.	DESCRIPTION	DATE	APPROVED
	E	REF ECR 4-013	4-10-85	JCH/LJM
	F	RENUMBERED/REF ECR 4-19	6-19-87	WMS
	G	REF ECN 01-0843	3-1-88	A.M.C
	H	REV VIA ECN # 01-1776	7/1/89	SAG
	J	REV. PER ECN # 01-4943	6/2/92	Kipw
	K	REV. PER ECN # 01-5685	3/19/93	SAGarand
	L	REV. PER ECN 01-7954	7-24-96	R.H.

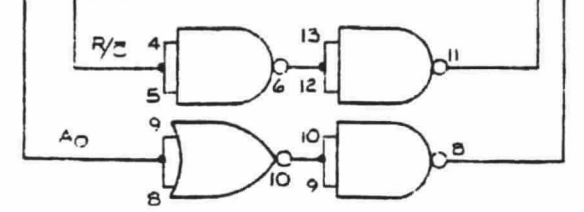
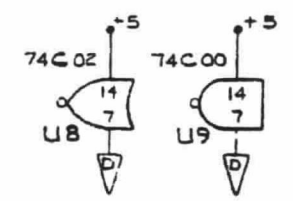
QTY REQD		PART OR IDENTIFYING NO.		NOMENCLATURE OR DESCRIPTION		MATERIAL SPECIFICATION		ITEM NO.
PARTS LIST								
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± N/A .0005 ± N/A ± N/A				APPROVAL DRAWN BRAATEN		DATE 7-83		<b>DADE</b> Dade MicroScan Inc. West Sacramento, CA 95691 USA  SCHEMATIC, A/D BOARD, AS-4
MATERIAL N/A				PREP SA		SIZE C		
FINISH N/A				PAY SEE SHEET		DWG. NO. 4240-0015		
DO NOT SCALE DRAWING				SCALE NOTE		REV. L SHEET 1 OF 2		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
4		REF SHEET #.1		

NOTES: ① CASE OF A/D AND PHOTO BD. SHOULD BE TIED OFF TO ANALOG GND AND ISOLATED FROM CHASSIS.  
② ALL CHIPS BY PASSED .1uF



TEST POINTS ARE J 1



N/A		N/A		N/A	
N/A		N/A		N/A	
N/A		N/A		N/A	

DADE  
Schematic, A/D BOARD, AS-4  
C N/A 4240-0015

4240-0

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REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE PER WR-4887	3/23/84	D TEETER
	B	REV PER ECH 81-7884	7-24-96	R. H. J.



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS: DECIMALS: DEGREES: ± --- ± --- ± --- ± --- ± --- ± ---		APPROVALS		DATE	DADE MICROSCAN INC. WEST SACRAMENTO, CA 95891		
		DRAWN P. Monks		2/18/84			
		CHECKED		D. TEETER	3/23/84	SCHEMATIC DIAGRAM LED, AS-4	
		BMSR		D. TEETER	3/23/84		
MATERIAL: ---		NPS		M. STANUIS	3/23/84	SIZE B	
FINISH: ---		Q.A.		C. THOMPSON	3/23/84		
DO NOT SCALE DRAWING				SCALE NONE		DWS NO. 4240-0021 SHEET 1 OF 1	

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